October, 1932

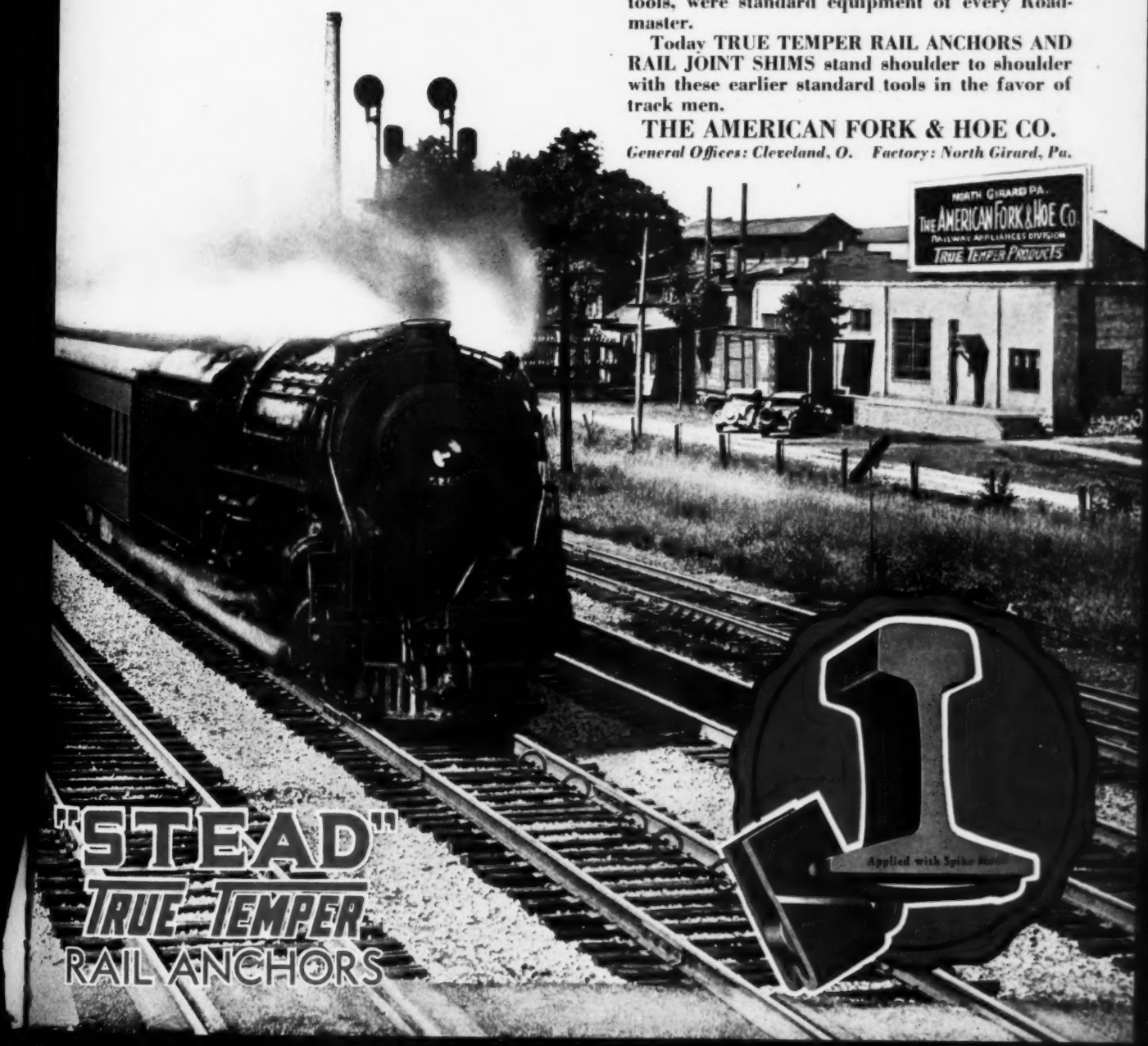
Railway Engineering and Maintenance

Before the Roadmasters Association was born, The American Fork & Hoe Company's TRUE TEMPER Ballast Forks, Scuffle Hoes, and allied tools, were standard equipment of every Roadmaster.

Today TRUE TEMPER RAIL ANCHORS AND RAIL JOINT SHIMS stand shoulder to shoulder with these earlier standard tools in the favor of track men.

THE AMERICAN FORK & HOE CO.

General Offices: Cleveland, O. Factory: North Girard, Pa.



Congratulations to the Roadmasters Association

in this our

Fiftieth Year

RAILWAY ENGINEERING AND MAINTENANCE

Published monthly by Simmons-Boardman Publishing Co., 2200 Port Washington Road, Milwaukee, Wisconsin. Entered as second class matter February 14, 1931, at the postoffice at Milwaukee, Wisconsin, under the Act of March 3, 1879.

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50 Years Old

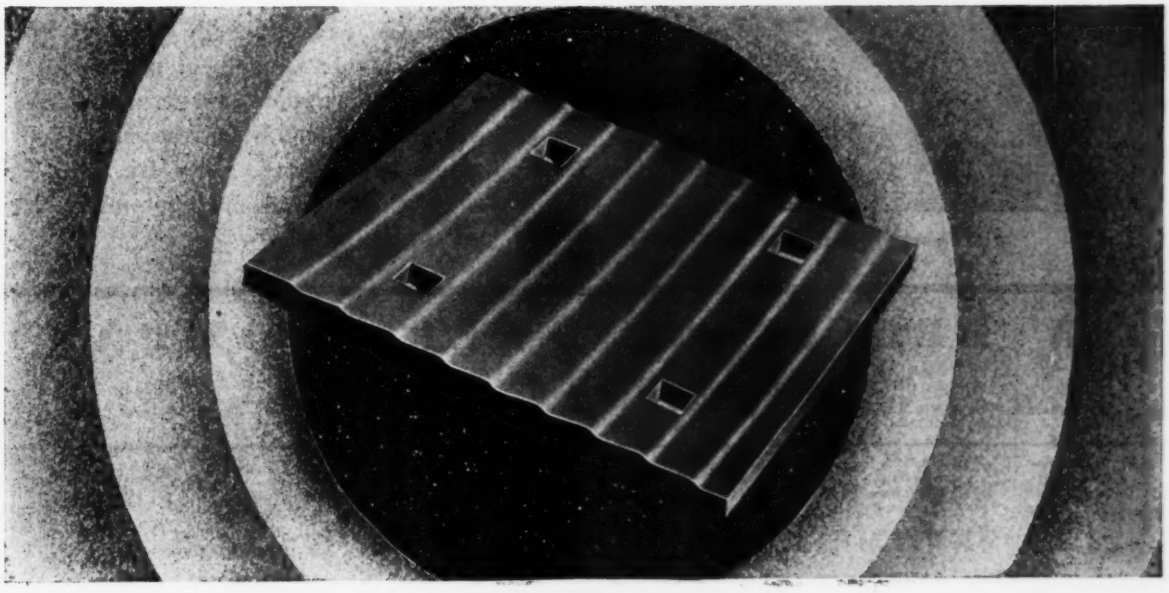
AND GOING STRONG!

THE Roadmasters' Association has lived a half-century of life extremely valuable to the American railroads. Since 1882, it has worked to improve railway practice, and, on the Association's birthday, the Lundie Engineering Corporation is proud to offer its congratulations for 50 years of progressive achievement.

As the manufacturer of a tie plate that affords real tie protection—the one tie plate, in fact, that holds track to perfect gauge without the use of destructive projections—the Lundie Corporation has a natural interest in track equipment progress, an interest that has always been strengthened by the inspiring cooperation of the Roadmasters' Association.

THE
LUNDIE ENGINEERING
CORPORATION
285 MADISON AVE., NEW YORK
59 EAST VAN BUREN ST., CHICAGO

LUNDIE TIE PLATE



PREVENTION

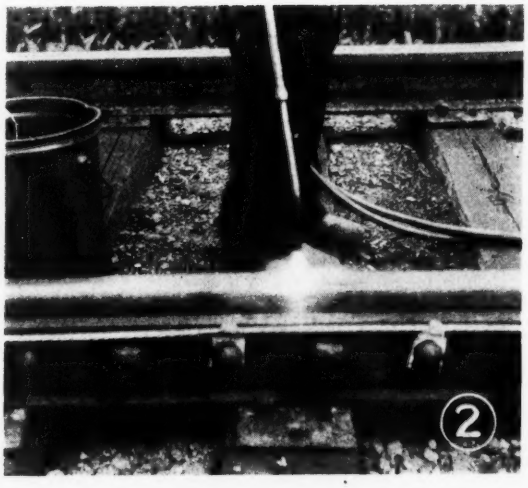
OF RAIL BATTER

By HEAT TREATMENT

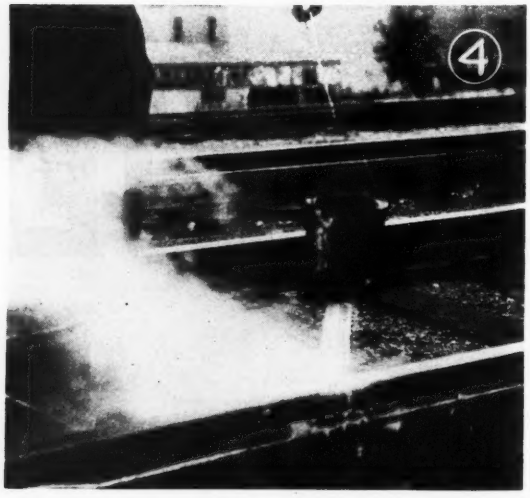
BEFORE commenting on this new method of preventing rail batter, the AIR REDUCTION SALES COMPANY wishes to take this opportunity to congratulate the Roadmasters' Association on its fiftieth anniversary and splendid record of achievement.

Members of the Association are familiar with this oxyacetylene method of *heat treating* rail ends which has become standard practice on so many important railroads.

As in the past, in connection with the use of all oxyacetylene equipment in track maintenance work, we wish to cooperate to the fullest extent of our resources.



Heating the Rail Ends to 1,500 Deg. F.



Quenching the Heated Rails

Our engineers have carefully followed the developments—new equipment has been designed for this operation—our servicemen are experienced in rail end heat treatment as well as welding and cutting. They are ready to assist you in putting this operation into effect on your road.

AIR REDUCTION SALES COMPANY

60 E. 42nd Street, New York

Airco—Davis—Bournonville Welding and Cutting Apparatus

Airco Oxygen—Airco Acetylene—Supplies—National Carbide

OFFICES

Baltimore	Bettendorf, Ia.	Birmingham	Boston	Buffalo	Charlotte	Chicago
Cincinnati	Cleveland	Dayton	Detroit	Jersey City	Kansas City, Mo.	Los Angeles
Louisville	Milwaukee	Minneapolis	New Orleans	Oklahoma City	Philadelphia	Pittsburgh
Portland, Ore.	Richmond	San Francisco	Seattle	Shreveport, La.	St. Louis	Wheeling

Represented in Texas by Magnolia Airco Gas Products Co., Houston, Beaumont, Wichita Falls, El Paso, Fort Worth and San Antonio. In Canada by Railway & Engineering Specialties, Ltd., Montreal, Que.

The Current News
EXTRA! EXTRA!
A Prominent Roadmaster recently said that
RAIL ANCHORS
had done more to prevent poor track conditions during the past two years
Than Any Other One Thing
THE P. & M. CO.
NEW YORK
CHICAGO
PARIS
MONTREAL
LONDON
CALCUTTA
SYDNEY

Greatest digging ability PER POUND OF WEIGHT

29,700 lbs.
SHIPPING WEIGHT

6 cyl. 54 H. P. Gasoline Engine

New speed and power • New weight distribution . . . No dead counterweight • All clutches interchangeable • Welded boom and sticks • No center pintle • Unit assembly • Priced to make it the greatest ½-yard value ever offered.

•

Chain crowd shovel with inserted-tooth dipper, dragline, crane, skimmer scoop, clamshell, dragshovel. Gasoline, Diesel or electric power.

A bantam-weight shovel with the ruggedness of a dreadnaught . . . that's what contractors have wanted. Now you can get it in this new Bucyrus-Erie 16-B ½-yard . . . more hustling, tenacious digging ability per pound of weight than has ever before been built into *any* excavator.

Here is power unhampered by deadweight, speed set free by easy operation, durability assured by special steels, complete accessibility and simple design. The 16-B is a challenge to low priced dirt, a money-maker on every job requiring a light, speedy machine.

Send for complete information on the 16-B. It is a machine which sets new standards of balanced value in the excavating industry.

BUCYRUS-ERIE COMPANY, So. Milwaukee, Wis.

562 B

BUCYRUS ERIE

NEW ½ YARD 16-B

SEE BUCYRUS-ERIE

TRESTLE REPLACEMENT accomplished with SAFETY... ECONOMY

ARMCO Paved Invert Pipe has many advantages for the speedy and economical replacement of trestles and small span bridges.

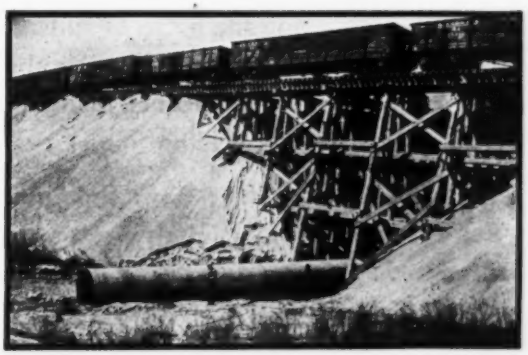
Major of these is that installation permits normal movement of trains. The job is completed with ease and speed at low labor cost. Expense for inspection and maintenance is practically eliminated.

In addition, Armco Paved Invert Pipe incorporates the three essentials to long-lasting, satisfactory culvert service. First of these is its *adequate strength* as provided by the corrugated metal type. Second, the *proved durability* as assured by Armco Ingot Iron, Nature-tested 26 years to date. And third, resistance against wear as provided by the extra-life pavement in the bottom.

No other culvert combines all these advantages, essential to safe, economical and efficient drainage.

Let an Armco man bring you facts and photos which point to savings of thousands of dollars in trestle replacement. Find out how much can be saved by the use of Armco Paved Invert Pipe and Replacement Methods on your prospective jobs. Mail the coupon.

This 36-inch Armco Paved Invert Pipe was placed under trestle, then backfilled to track level.



66-inch Armco Paved Invert Pipe replacing a 250-foot trestle in Georgia.

Armco culverts and drains are manufactured from Armco Ingot Iron of The American Rolling Mill Company and always bear its brand.

OTHER ARMCO DRAINAGE PRODUCTS

Perforated Pipe
Part-Circle Culverts
Automatic Drainage Gates
Multi-Plate Pipe
Metal Cribbing

ARMCO PAVED INVERT PIPE

ARMCO CULVERT MANUFACTURERS ASSOCIATION

Middletown, Ohio

Gentlemen:
—I would like to see factual data on trestle replacement.
—I would like to know more about the improved Armco Paved Invert Pipe.

Name .....
Title .....
Road .....
Address .....
City .....

RE&M—10

TURN OLD RAILS INTO NEW

by

OXWELDING

NOT literally, of course, but you can make old rails ride like new by Oxwelding the battered ends.

You can materially increase the life of the rail and reduce maintenance cost by Oxwelding joints.

Oxwelded frogs, switchpoints and crossings indefinitely postpone purchases of new material.

Oxwelded butt joints in street and road crossings and through tunnels save their cost many times over during the life of the rail.

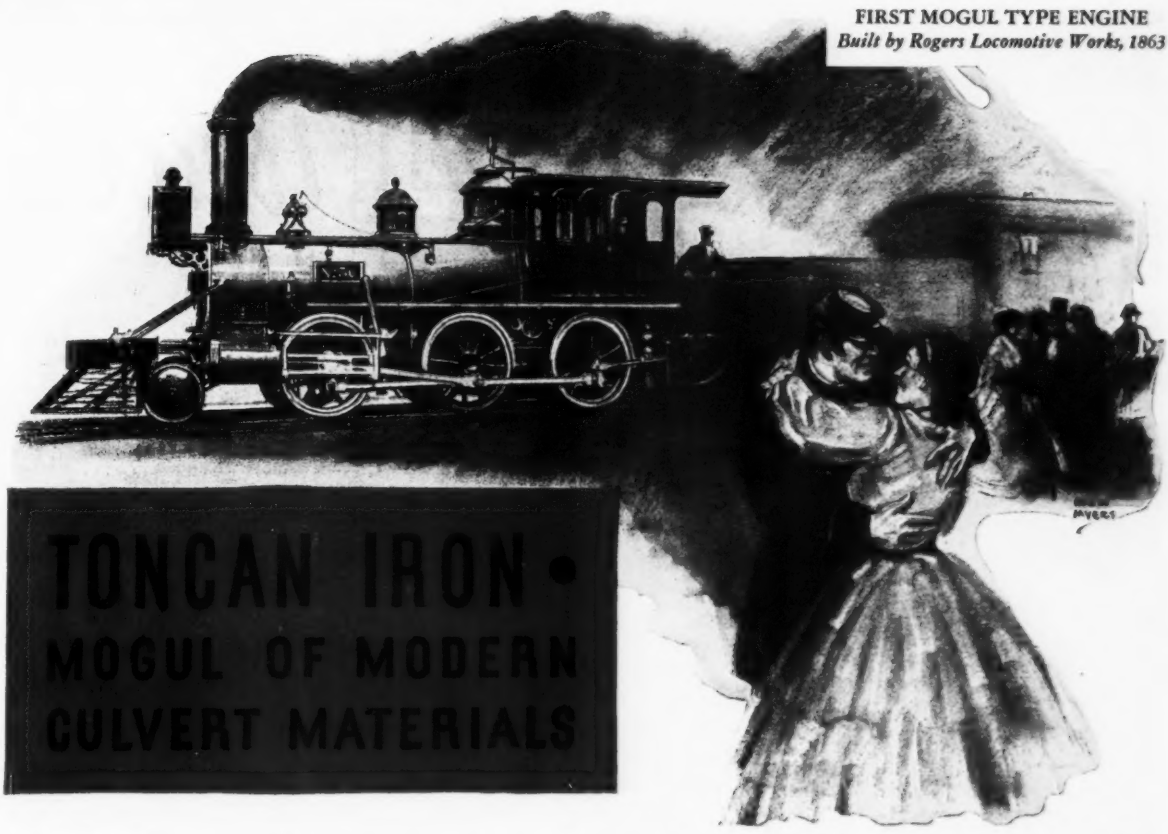
Year after year Oxweld Railroad Service proves of increasing value to the majority of Class 1 Railroads.

The Oxweld Railroad Service Company

Unit of Union Carbide and Carbon Corporation

UCC

NEW YORK, Carbide and Carbon Building CHICAGO, Carbide and Carbon Building



FIRST MOGUL TYPE ENGINE
Built by Rogers Locomotive Works, 1863

When the first true Mogul type engine was built in 1863, it was so far in advance of existing types of motive power that the name "Mogul" was chosen to indicate its superiority. Today Toncan Iron occupies the same position among culvert materials—this modern alloy of scientifically refined iron, copper and molybdenum ranking first among the ferrous metals after the stainless irons and steels in its resistance to rust—a resistance that is uniform throughout the entire thickness of the metal.

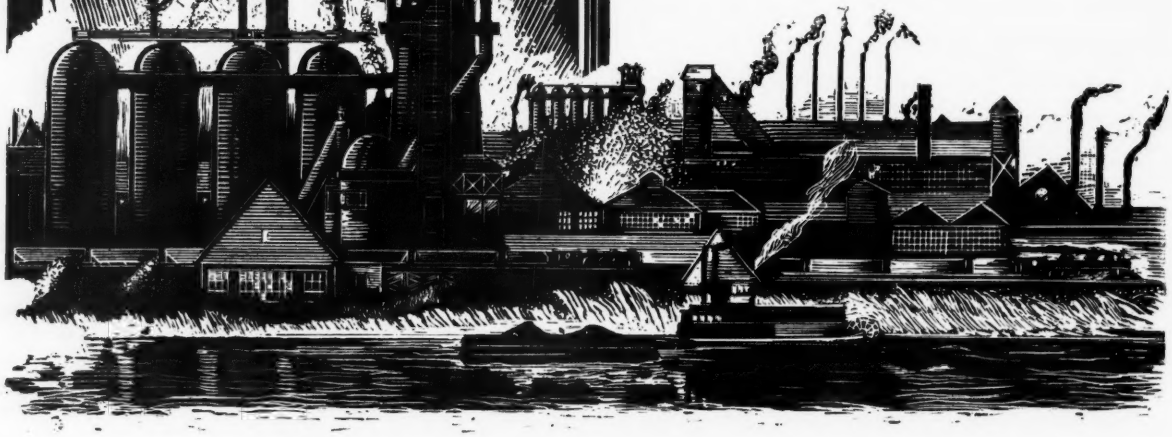
Another feature of Toncan Iron Culverts that should be kept clearly in mind when various types of culvert structures for railroad service are under consideration, is their resistance to the vibration caused by heavy rolling loads. Here the flexibility of corrugated sheet culvert construction is of particular advantage as it gives with the load, whereas more rigid structures might quickly be damaged or destroyed.

Toncan Iron Culverts last longer with lower maintenance and, therefore, are more economical. A letter will bring the Toncan Iron Culvert Handbook to your desk. Write today.

TONCAN CULVERT MANUFACTURERS' ASSOCIATION
YOUNGSTOWN • OHIO
Chicago Railway Sales Office . . . . . 310 South Michigan Avenue, Chicago, Illinois

74 years

have elapsed since a little forge shop was established at Girty's Run in Millvale, Pa., to manufacture railroad car axles, forged from scrap iron. This was the humble beginning from which Carnegie Steel Company has grown. Carnegie products for railroad use now include wrought steel wheels for all classes of service, rim toughened wheels for passenger, engine tender and engine truck service, axles, car building sections, rails, rail joints, tie plates, spikes, steel cross ties, and GEO track construction materials. It is our constant endeavor to amply justify the faith the railroads have learned to place in "Carnegie" steel products.



CARNEGIE STEEL COMPANY -:- PITTSBURGH, PENNSYLVANIA

Subsidiary of United States Steel Corporation

202

CARNEGIE

Any place—any time—speedy crane service

LOADMASTER WITH "CATERPILLAR" ENGINE AND TRACKS

CROSSING the yards—climbing right-of-way banks—threading a nimble way through narrow shop or warehouse aisles—this Loadmaster handles scores of lifting, carrying and hauling jobs. Whether its load is a pair of wheels, a barrel of paint, or a telegraph pole, is all the same to its full-revolving crane of 4500 pounds' capacity.

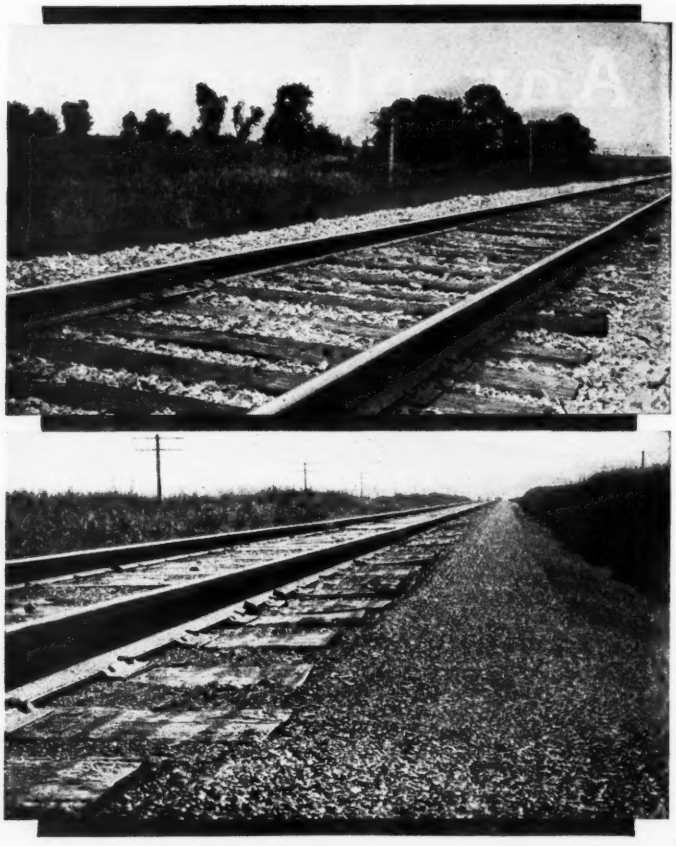
It's a ruggedly powered unit—a husky 4 x 5½ "Caterpillar" Engine drives its mechanism through a sturdy "Caterpillar" transmission. And the Loadmaster travels wherever it's asked to go on sure-treading "Caterpillar" tracks (modified for this duty by the Bucyrus-Erie Company). For complete particulars write Bucyrus-Erie Company, South Milwaukee, Wisconsin.

(The Loadmaster is built with "Caterpillar" Engine and Tracks)

Caterpillar Tractor Co., Peoria, Ill., U.S.A.

Track-type Tractors Road Machinery
Combines

(There's a "Caterpillar" Dealer Near You)



PROTECT THE RAILS . . . .

PROPER maintenance of track is the fundamental of successful railroading. Preventing the ravages of rust and brine on rails is an important problem in track maintenance. When correctly applied Liquid Asphalt Rail Coating acts as a preventive of corrosion to rails and bolts, increases the life of spikes, anchors and tie plates, and assists in allowing the rails to expand and contract uniformly.

Liquid Asphalt Rail Coating has a consistency that permits easy application. It is adhesive and highly resistant to the elements that cause rust.

Where Liquid Asphalt Rail Coating is used it saves its cost many times in its protection against corrosion and thus materially increases the life of rails. Let us show how inexpensive it is to use Liquid Asphalt Rail Coating.

STANDARD OIL COMPANY, (Indiana) 910 SOUTH MICHIGAN AVE., CHICAGO

108-B

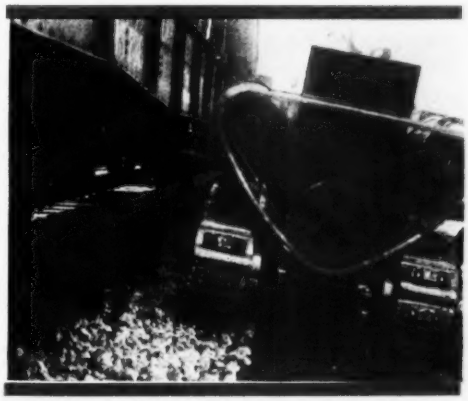
LIQUID ASPHALT RAIL COATING

STANDARD OIL COMPANY (INDIANA) SERVICE

THE NEW FACTOR

Tie tamping—no pipe—no extra hose.

Over a bridge—no harm to ties.



Tilting out to clear traffic. Does not disturb ballast.

Present day conditions demand a New Factor in every line of endeavor. In railway maintenance work, Cletrac is that factor—and a big one.

Cletrac is a crawler tractor, adapted by tractor engineers and practical railway men to handle a wide range of maintenance work.

It has demonstrated its utility and ability to save time on such jobs as tie tamping, rail end welding, cleaning culverts, excavating and grading work, laying rail, dismantling track, mowing right of way, plowing or sweeping snow, plowing fire guards.

Cletrac handles this work quickly, economically and without interference to traffic.

ADVANTAGES

Minimum interference with traffic.

Guaranteed operating angle of 35 degrees in any direction.

Operates over bridges without damage to ties.

Rides over ballast without disturbing it.

Clears narrow rights-of-way and negotiates other difficult places.

Eliminates long hose or cable, thereby reducing both original and operating costs of auxiliary equipment.

Easy to steer. Easy to stop on level or steep inclines.

Tractor draw-bar free from interference and is available at all times.

Universality; adapted to a wide range of work and can be used all the year round.

Easy to load onto work train. Can be loaded onto flat car under its own power.

Congratulations! Roadmasters and Maintenance of Way Association on your Golden Anniversary.

THE CLEVELAND TRACTOR COMPANY

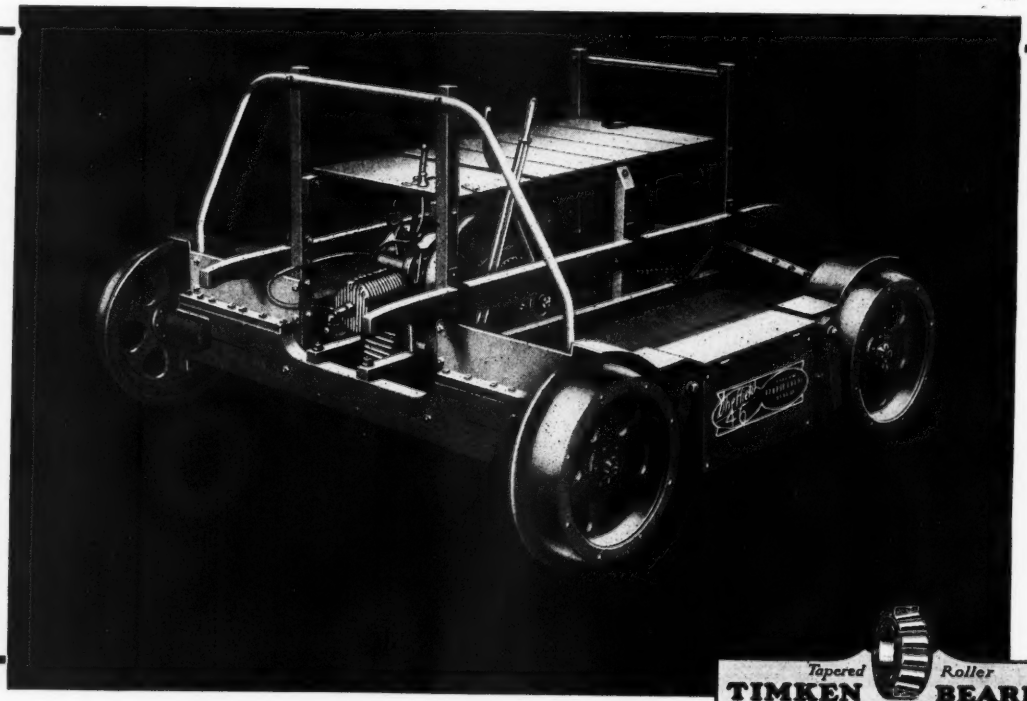
For years builders of tractors for industrial, agricultural, civic and military uses

CLEVELAND OHIO

Cletrac CROWLER TRACTORS

Reg. U.S. Patent Office

The "Sheffield" 46 light weight inspection car



Tapered Roller TIMKEN BEARING EQUIPPED

compare it!

Total weight, with windshield and rail sweeps, is 447 pounds. Total capacity is three gallons—enough, under average conditions, for a mileage of 150 miles. Motor is single-cylinder, air-cooled, two-cycle type with high tension-magneto ignition. Transmission to driving axle by chain and sprockets through simple friction plate clutch. Standard seat is lengthwise of car and provides space for three men. The lifting handles are so located that one man can remove the car from track with ease. Speed can be throttled to 2 miles per hour.

Compare it!

You will find the "Sheffield 46" the lightest, sturdiest, smoothest riding, easiest to handle and the best value ever offered in the inspection car class.

Full information gladly furnished on request. Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill.

FAIRBANKS-MORSE

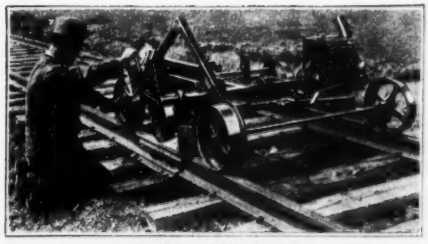
MOTOR CARS

FIRST ON THE RAILS—AND STILL FIRST

5817-RA21.88

The NORDBERG LINE

Delivers Thrift to Every Point!



Nordberg Rail Grinder

Nordberg Power Jack

Nordberg Spike Puller

Nordberg Tie Adzer

Besides leading the way to better and more permanent track, Nordberg Machines are effecting economies all along the line of track maintenance.

This line of Nordberg Track Maintenance Machinery was developed to meet your track problems; to enable you to secure better surfaced track, track that will last longer and cost less to recondition and maintain. By assuring better and more permanent track, these machines lengthen the life of newly laid rail and lower the cost of rail laying.

All along the line, you can use Nordberg Power Track Tools to save money and improve track standards. Every machine is furnished with complete equipment. You do not have to buy a lot of accessories to fit them to their jobs.

+

Railway Equipment Dept.

NORDBERG MFG. CO.

Milwaukee, Wisconsin

Nordberg Cross Grinder

Nordberg Rail Drill

Nordberg Track Shifter

TRACK MAINTENANCE MACHINERY

No. 46 of a series

Railway
Engineering and Maintenance
SIMMONS-BOARDMAN PUBLISHING COMPANY
105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: Continuity of Service

September 29, 1932

Dear Reader:

As you have received your copy of Railway Engineering and Maintenance from month to month, I wonder if you have ever given any thought to the continuity of this service. Probably you have taken it for granted – a not unnatural attitude. Yet in these days when nearly every business is curtailing its activities and many are suspending operations entirely for the time being, I feel that the regularity of receipt of your publication is not unworthy of attention.

This fact was driven home to me a few days ago when I was passing the plant of a prominent railway supply manufacturer which was entirely shut down. Inquiry developed that the only employee on the job was the watchman. Every other person had been laid off. Yet, on the receipt of orders it can resume operations on short notice without loss of any privileges or rights. In the same manner, although to a lesser degree, a railway can curtail its service as the volume of business declines, although, of course, not to the point of suspending operations.

With a publication such as Railway Engineering and Maintenance, however, conditions are more exacting. Issues cannot be gotten out at will or abandoned as the income declines, but the paper must be published at the specified intervals or it must go out of business entirely.

Even though many of those companies which formerly patronized our advertising pages have closed down their factories and the roads on which you are employed have taken off one train after another, Railway Engineering and Maintenance continues to serve you month after month during this critical period, bringing to you those developments in methods and those changes in personnel that aid and interest you. This is an obligation that bears heavily in days such as these. The many words of commendation that we receive from you, however, show us that this service is appreciated.

Cordially yours,

Elmer T. Howson

ETH*JC

Editor.

MEMBERS AUDIT BUREAU OF CIRCULATIONS AND ASSOCIATED BUSINESS PAPERS, INC.

Yes!

50 YEARS IS A LONG TIME

BUT the Roadmasters' Association has crowded a century of achievement into *its* 50 years of service. The Rail Joint Company takes real pride and pleasure in congratulating this organization which has done so much, in the period from 1882 to 1932, to improve American railway practice. This company desires not only to pay its respects to the Roadmasters' Association on its Golden Anniversary, but to express deep appreciation of the spirit of cooperation encountered at all times in its members.

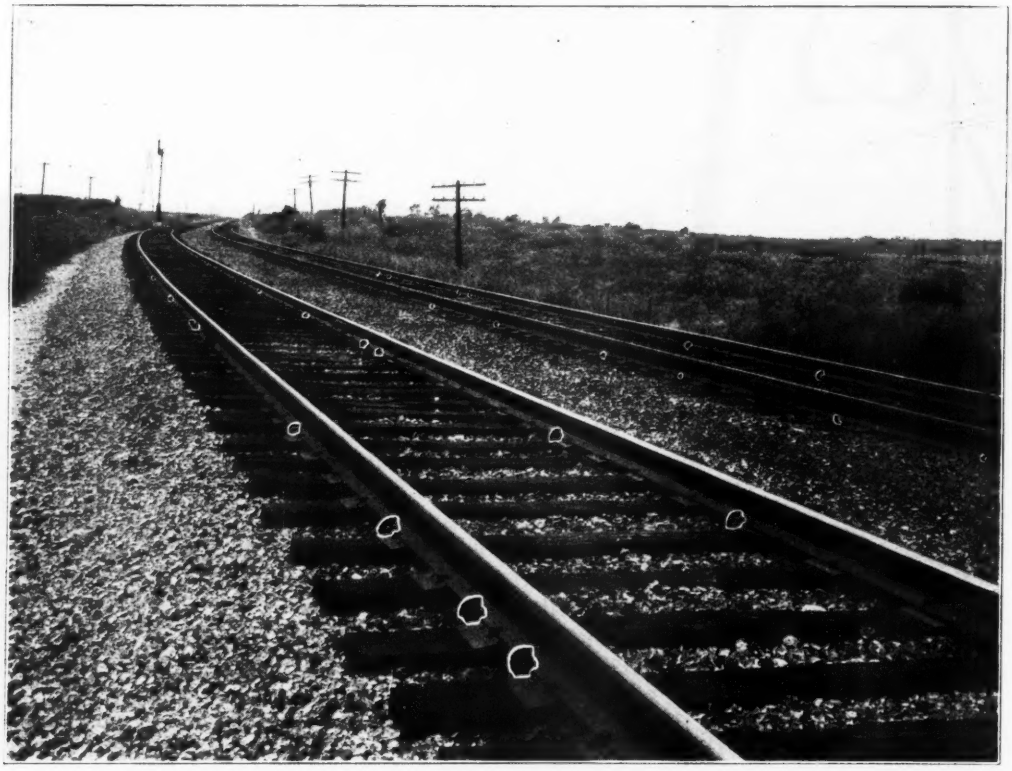
It is certainly fitting that joined with the Roadmasters, in celebrating an extended period of progress, is the Track Supply Association. Though younger in years, its accomplishment in building up so complete an exhibit of track materials earns it the congratulations of everyone in any way concerned with advancing the development of track equipment on American Railroads. The Rail Joint Company desires that this message stand, in some measure, as its recognition of the invaluable assistance rendered by the Track Supply Association through its cooperation with the Roadmasters' organization.

THE RAIL JOINT COMPANY

165 BROADWAY NEW YORK, N. Y.

ROADMASTERS--*Now*

is the time to lay a New Foundation of TRACK PERMANENCE . . . . .



START BUILDING UP WITH ERICSON RAIL ANCHORS!

In your new road reconstruction program start right at the beginning with ERICSON Rail Anchors and get 100 per cent insurance against creeping strains, temperature or other factors.

This 100 per cent performance is only possible with the two piece ERICSON which exclusively provides a frictional gripping area rather than a spring tension.

The greatest holding power in an anchor can be developed only by friction and therefore the improved ERICSON provides greatest insurance against creeping and greatest protection to both rail and tie.

Rebuild correctly by starting with ERICSON.

ERICSON RAIL ANCHOR

INDUSTRIAL AND RAILROAD SUPPLY COMPANY

NATIONAL SALES REPRESENTATIVES — MANUFACTURED BY ILLINOIS MALLEABLE IRON CO. — 310 SOUTH MICHIGAN AVE. CHICAGO

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30 Church Street

CLEVELAND
Terminal Tower

WASHINGTON, D. C.
17 and H Streets, N. W.

SAN FRANCISCO
215 Market Street

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Printed in U. S. A.

Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

OCTOBER, 1932

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ELMER T. HOWSON
Editor

WALTER S. LACHER
Managing Editor

NEAL D. HOWARD
Eastern Editor

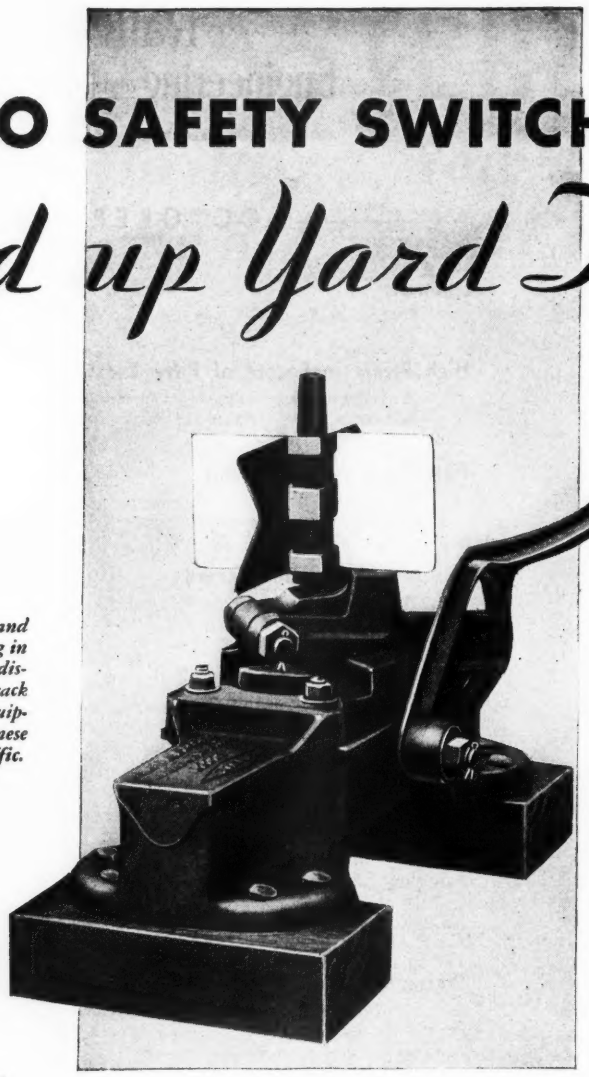
GEORGE E. BOYD
Associate Editor

M. H. DICK
Associate Editor

F. C. KOCH
Business Manager

RAMAPO SAFETY SWITCH STANDS

speed up Yard Traffic



Behind Racor Service stand nine plants specializing in the manufacture and distribution of railroad track turnout and crossing equipment, including Manganese Work for heavy traffic.

The picture at left is a model No. 20 B Ramapo Safety Switch Stand with low target. A newly developed three-piece cover makes oiling and inspection easy. Write for information.

IN THE rapid handling of cars during switching operations there is the ever-present chance of shunting cars through closed switches with resultant damage to switch points and rigid switch stands. Regardless of the known hazards of such miscalculations, and in spite of the discipline with which switching crews are imbued, mishaps of this kind are frequent. Invariably, with rigid switch stands, they result in delay and expense. This constant threat of trouble makes men over-cautious and slows up their work.

RACOR TRADE MARK REGISTERED

Ramapo Safety Switch Stands completely eliminate all the penalties of trailing through closed switches. When this occurs, a spring mechanism allows the points to move over under pressure of the wheel flanges and properly carry the car on its way. No damage is done to the points or to the switch stand. The target follows the points and indicates their true position, whether thrown automatically or by hand.

So successfully have these simple devices done their appointed task that more than 300,000 of them are in use on 300 railroads.

RAMAPO AJAX CORPORATION

Racor Pacific Frog and Switch Company . . . . Los Angeles — Seattle
Canadian Ramapo Iron Works, Limited . . . . Niagara Falls, Ontario
General Offices—230 Park Avenue, New York
Sales Offices at Works and McCormick Bldg., Chicago
Midland Bank Bldg., Cleveland, Ohio Metropolitan Bank Bldg., Washington
Builders Exchange Bldg., St. Paul Union National Bank Bldg., Houston, Texas
Nine Racor Works: **Hillburn, N. Y., Niagara Falls, N. Y., Chicago, Ill., East St. Louis, Ill. Superior, Wis., Pueblo, Col., Los Angeles, Cal., Seattle, Wash., Niagara Falls, Ont.**

Railway Engineering and Maintenance

POLITICS

Of Vital Interest to Railway Employees

THE railways are not in politics. They have not been for decades. Yet both of the major parties are recognizing the needs of the railways today in a way that they have not done for years and are appealing for the votes of railway employees on the basis of their position on this problem. On the one hand, the Republican party recognized the necessity for giving the railways fair and equitable treatment in the platform which it adopted at the Chicago convention. Its chief candidate and other spokesmen are also pointing to the various measures which have been initiated by the administration for the aid of the railways, including the provision in the set-up of the Reconstruction Finance Corporation for aid to needy carriers, the more recent suggestion that funds be made available for repairs to equipment, etc. Likewise, the Democratic party, while not including reference to the railway problem in its platform, has rallied to its leader's unusually clear presentation of the railway situation in an address at Salt Lake City a few days ago in which he showed a keen appreciation of the necessity for supporting measures required to the relief of the financial stringency of the railroads.

Why This Interest?

Why has this interest been so suddenly aroused? Of what concern is it to railway employees? What should be their attitude? These are questions of live interest to the more than 1,500,000 persons who normally look to the railways for employment, to the equally large number of employees of those companies which produce the materials and equipment required by the railways, and the further and probably larger number of tradesmen and others who serve these employees of railway and railway supply companies, all of whom, in the aggregate, comprise several million voters.

Considering the first question: The greater interest that is now being taken in the railways comes, in part, from a recognition by the party leaders that the solution of this problem is essential to the welfare and prosperity of the country and that so long as the railways are in difficulties and unable to make normal expenditures, a handicap is placed on business as a whole which cannot do other than retard recovery.

But there is another and even more important reason. Under the form of government under which we operate, those who are elected to high places must seek votes. They seek votes by supporting measures favored or demanded by their constituencies. That both of the leading parties are now sponsoring relief for the railways is an indication that they believe that votes are to be gained by this action.

A Marked Change

Herein is a change of vast importance to railway employees and, in fact, to the railways themselves. Years ago the railways, as corporations, were very definitely in politics. They wielded a vast influence in the selection of candidates and in the formation of their platforms. Abuse of this power led to a popular demand for the removal of this influence and for two or three decades the railways have refrained from such activities. As a result, they have had no spokesmen and defenders when singled out for attack.

Of late, however, this situation has changed. Faced with the fact that some 800,000 of their number have lost their positions while thousands of others are working part time by reason of the decline in earnings of the roads to which they have been accustomed to look for employment, the employees have awakened to a realization that they have a very definite stake in the prosperity of the roads and they are uniting into groups all over the country to fight against the inroads of competitive agencies of transportation. These groups have votes and it is votes that count with candidates for public office. The candidates have their ears to the ground and they are hearing the rumblings of discontent among these millions of voters who are dependent, directly or indirectly, upon the prosperity of the railways. This is the reason for the interest that both major parties are displaying in the welfare of the railways. It is a hopeful sign.

Should Scrutinize All Candidates

But it is not enough that the two parties should be pledged to the more equitable treatment of the railways. The man who will be elected president, and thereby become the chief spokesman of his party, will wield great influence. Yet he cannot of himself remove the inequalities under which the railways are now laboring, for many of these inequalities can be removed only by legislation, national and state. It is equally important, therefore, that candidates for Congress and for the state legislatures be equally cognizant of the railway problem and of the attitude of railway employees, and of the further fact that these employees will vote only for those who are friendly to the railways.

Now is the time for action. Candidates are seeking election. Railway employees must be aroused to the necessity for demanding equality of competition by in-

sisting on the elimination of the subsidies now being granted to highway and waterway carriers and demanding the revision of the regulation of railway and competing carriers to bring them on a comparable basis.

The prosperity of the nearly 400,000 maintenance of way employees and of the 1,500,000 railway employees as a whole, together with those in industries dependent upon railway purchases, is so directly dependent on equitable treatment for the railways that every individual should ascertain the attitude of candidates for office on these matters that are of such direct financial concern to himself and vote accordingly.

A RECORD

Covering a Half Century's Achievements

WHEN an organization has functioned for half a century and at the end of that period is still alert and growing, it is evident that there is a need for that association and that it is meeting that need. Such a record is proof also that the organization has been well directed through the years. This is the history of the Roadmasters' Association, to whose golden anniversary we give recognition in this issue.

The Roadmasters' Association is the pioneer in the engineering and maintenance of way field in America. It has built for itself a record of achievement to which its members may point with justifiable pride. Its contribution to the promotion of more efficient maintenance practices is marked. Its reports are recognized as coming from practical men who know whereof they speak and as such they are given much weight.

Reasons for Success

The success of the Roadmasters' Association is due to many factors. Outstanding among these is its devotion to duty, the chief evidence of which is the decision year after year to meet in a central point accessible to the largest number, to the disregard of excursions to more remote points. At the conventions, likewise, little thought is given to entertainment—night sessions are the rule, while the exhibit is taken as an opportunity to learn of the newer and more efficient developments in equipment and materials rather than as a source of entertainment. In other words, the members take their conventions seriously. This characteristic, more than any other, distinguishes the Roadmasters' Association. It is the secret of the success of the organization.

It has been no accident that nine railway presidents, five vice-presidents and eleven chief engineers have presented addresses and papers before the association during the last ten conventions. This was not always so, for if a railway executive ever made his presence known at any of the first 24 conventions, the fact was carefully suppressed in published reports. Mayors of convention cities and even governors of states addressed the roadmasters in those early days, but never a railway president, a vice-president or a general manager. It must not be inferred from this that the association was entirely ignored by the railway managements for its activities did receive such tacit approval as was manifested by the furnishing of special trains for not a few of the extensive tours to remote places of meeting. Nevertheless, the fact that addresses by railway executives have come to be a regular feature of the Roadmasters' conventions is tangible evidence not only of the high regard with which that body is held today by those who direct the affairs of the carriers, but in even greater measure by the fact that they believe that concrete good can be accomplished by addressing this group of supervisory officers in person.

Railway Executives Participate

The first railway president to address the Roadmasters was B. F. Bush, of the Missouri Pacific, at St. Louis in 1911, followed in 1916 by Ralph Peters of the Long Island. However, it was not until the following year, when the association was accorded an outstanding position in an entirely different way, that addresses by railway executives transcended the status of a more or less formal exchange of greetings.

In 1917, the railways were in sore straits. They were compelled to handle a war-time traffic while faced with a wartime shortage of men and materials. So serious was the situation that conventions of a number of leading associations of railway men were abandoned because it was felt that the members could not be spared from their work. Not so with the Roadmasters, for although no group of railway officers was confronted with greater difficulties, as they had to put up with the poorest class of labor—the misfits and rejects of other industries—it was the conviction of the railway managements that the Roadmasters' convention should be held and that members should be encouraged to attend. Furthermore, R. H. Aishton was one of the principal speakers, not in his capacity as president of the Chicago & North Western, but as a representative of the Railroads War Board, in order that he could present to the roadmasters the part that they must play in the winning of the war. Again in 1918, in spite of the continued suspension of the activities of other associations, the Roadmasters' Association was encouraged to hold its convention, and instructions were issued by the Railroad Administration to federal managers to arrange for the attendance of as many maintenance of way officers as possible. Furthermore, two regional directors, B. F. Winchell and Hale Holden, addressed the meeting on important problems of the time.

Position Thoroughly Established

The important place thus established for the Roadmasters' Association in the minds of the railway executives, was in no wise lost with the return of the railways to their owners in 1920. The end of federal control brought new problems, and while it was realized that the primary function of the conventions was to afford an opportunity for the study of track maintenance, the executives saw in them also the opportunity for the establishment of a closer contact between the managements and this group of supervisory officers.

As has been frequently stated, the roadmaster and the section foreman come in contact with the public in the course of their work more frequently than any other class of railway employees with the possible exception of the station agent. The roadmaster, as a consequence,

occupies an important place in public relations and it was small wonder that the conventions were seized upon as the means for driving home to them the part that they must have in developing a more favorable attitude toward the railroads on the part of the public.

The Value of Conventions

On the whole, however, the Roadmasters' Association has been fostered by the managements because of the good that has come from its meetings through the profitable discussion of the intricate problems of its members. This point was well expressed by W. B. Storey, president of the Atchison, Topeka & Santa Fe, in his address at the convention at Kansas City, Mo., in 1925.

"No one man knows it all. Human knowledge today is vastly greater than it was one hundred years ago, and it is made up of not what one man has found out, but by the accumulated knowledge of many thousands of men. Then again we learn by mistakes—either of our own or of others. The opportunity of meeting other men in the same field of endeavor, of listening to the experiences of others, of learning by the mistakes of others, is profitable to us all, and such meetings as this are profitable because you have a chance to learn what the other man thinks."

Convincing as this argument is, it holds good only if those who direct the affairs of the association do so with skill and good judgment and if those who attend its meetings take a sincere interest in the papers and reports. These requirements have been effectively fulfilled by the Roadmasters' Association.

A JUSTIFICATION

Bread Cast Upon the Water Returns

ONE could desire no better demonstration of the improvement that was made in railway track and roadway in the nine years ending with 1929 than that now afforded by the singular absence of slow orders after nearly three years of severely restricted expenditures for maintenance. It is true that much work has been left undone that must be made good eventually; however, if comparison is made with the conditions that prevailed immediately following the war, when maintenance operations were subjected to restrictions far less severe than those of the last three years, the tracks cannot be considered to be in other than excellent condition.

Why this marked difference? Rail has stood up in spite of an extremely low rate of renewal because of the marked increase in weight on lines of all classes and because of improved methods of conservation. The tie condition is at a high standard because treatment and better protection have resulted in such a remarkable reduction in the rate at which ties require renewal that a drastic reduction of replacements over a period of three years has resulted in a scarcely greater decrease in the average tie condition than that caused by a corresponding curtailment for a single year a decade ago. The effect of limitations on ballasting and surfacing work has been offset to a large extent by the roadway improvements made prior to 1929. Widening of roadbed and greatly improved drainage have corrected conditions that were responsible for much of the ballast requirements of past years.

It must be recognized, of course, that with decreases in traffic wear and tear has been less. It must be realized also that the present condition of the properties is such as to require greatly increased expenditures to make good the work left undone since 1929. Nevertheless, the condition of the tracks as they are today is eloquent testimony on the foresight and prudence of railway managements.

OPPORTUNITIES

There Are Plenty For the Man Who Tries

IT HAS been said that the most serious need of the present in maintenance of way is to maintain the morale of the forces. While this comment applies to all departments, it is especially pertinent in its implication with respect to those who are concerned with the upkeep of the tracks and structures. This is to be expected. Maintenance men who take pride in seeing their tracks and structures kept in first-class shape are sorely tried when the condition of the property in their care is allowed to deteriorate or when they are compelled to adopt expedients which in more prosperous times were classed as highly questionable practices.

But is there not an opportunity to develop a wholesome enthusiasm in striving to do the best job possible with the means at hand? That the answer is in the affirmative is shown by the letter from H. J. Barkley, on page 635 of this issue, and by his article, Making Old Roofs Last Longer, that was published on page 556 in the September issue. In other words, pride of accomplishment must be expressed in these days not so much in how well the property is being maintained as in how much can be accomplished when there is little to do with. As a matter of fact, there is more opportunity to show real ability in these times when every dollar counts for so much than there is to make a showing when appropriations are adequate. In his letter in this issue, Mr. Barkley points to some opportunities for economy in the construction of overhead highway bridges, while his article in last month's issue was replete with suggestions for carrying over defective roofs at a minimum of expense. His ideas are ingenious, but he has by no means exhausted the opportunities. Others can show their mettle by manifesting equal enterprise in meeting the problems that come their way.

FREIGHT TRAFFIC—Freight traffic handled by the Class I railroads in the first seven months of 1932 amounted to 147,002,378,000 net ton-miles, which was a reduction of 57,617,114,000 net ton-miles, or 28.2 per cent, under the corresponding period of 1931, according to reports compiled by the Bureau of Railway Economics. This total also represented a reduction of 40.7 per cent under the same period of 1930. Total freight traffic in July amounted to 19,065,360,000 net ton-miles, which was a reduction of 37 per cent under that of the same month of 1931.

High Points in A Record of 50 Years*

A review of some of the important events that have transpired during the half-century's existence of the Roadmasters' and Maintenance of Way Association of America

THIS year marks the Golden anniversary of the Roadmasters' and Maintenance of Way Association of America. It is fitting, therefore, that we study its beginnings, its aims and purposes at the time it was formed and the methods it has followed through the years of its career. It is also both interesting and instructive to review the convention records, particularly those of the earlier years, to note the growth of the society and the changes that have occurred in the character of the membership.

Organized in 1882 as the Roadmasters' Association of America, it is the oldest organization of maintenance of way officers in America, antedating the American Railway Bridge and Building Association by 8 years and the American Railway Engineering Association by 18 years. Substantially at the same time, however, an association having similar aims was organized in the East under the name of the New England Roadmasters' Association. This latter society flourished for a time, but since its deliberations practically duplicated those of the larger and more influential association, while many of its members belonged to both, it eventually gave way, leaving the international society alone in the field.

At the time the association was formed, railways had existed in this country for approximately half a century. During all of this period, there had been a rapid expansion in railway mileage. Subsequent to the Civil War, however, railway construction had been greatly accelerated. New roads were being built into uninhabited, and sometimes practically unexplored, sections west of the Mississippi, while additional lines were being constructed and existing lines extended in the older and more densely populated sections east of the river.

As a result of this multiplicity of new projects and extensions of others, there was a steady demand for capable men in both the construction and maintenance fields. Many who entered this work had had little or no opportunity for previous training and since there was no agency whereby they might exchange views and develop common practices, marked individuality developed, both among the engineers who were engaged in construction and the officers who were responsible for maintaining the roads after they were placed in operation.

For these reasons there were no standards in the present meaning of the term, even with respect to gage, as between roads, and often the practices on different divisions of a road varied as widely as those on different roads. Rail sections, joints and accessories, frogs and switches, tools and, in fact, practically all maintenance materials and methods as they were applied were the outgrowth of local conditions or of the personal ideas of the individual roadmasters or chief engineers. Furthermore, because the nature of their work tended to isolate them and prevent contacts with others similarly engaged, the trend toward individuality in their practices was increasing. In consequence, the situation with respect to maintenance was extremely chaotic.

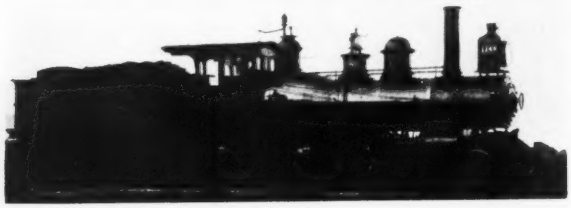
How the Association Was Organized

In view of these conditions, the more progressive men in the maintenance field had recognized for some time the need for an organization whereby those engaged in this branch of railway service could come together to discuss their mutual problems and gain social acquaintance. Accordingly, after considerable preliminary work and a number of informal meetings extending through the larger part of 1882 and the early months of 1883, a call was sent out for a general meeting for the purpose of organizing. This meeting was held in the Matteson House, Chicago on June 13 and 14, 1883, with 61 present, representing 24 roads.

A temporary organization was perfected, with Isaac Burnett (C. R. I. & P.) in the chair and John Tierney (C. R. I. & P.) as secretary. Immediately thereafter, and indicating an attitude which will be referred to later, a motion was offered "That we, the delegates present at this meeting, do form ourselves into an association to be known as the Roadmasters' Association of America." At once a number of delegates were on the floor clamoring for the privilege of seconding it. Permanent officers were then elected to serve until the first convention. These were: Isaac Burnett, president; George C. McMichael (L. & N.), first vice-president; David Wright (C. M. & ST. P. .), second vice-president; John Tierney, secretary; Thomas Adamson (O. & M.), treasurer; and S. L. Sweeney (W. ST. L. & P.), J. H. McDonald, (C. B. & Q.) and J. C. Evans (W. C.) members of the Executive committee. A constitution and by-laws which had been prepared in advance were adopted and signed by those in attendance.

The afternoon of this day was spent at the National Exposition of Railway Appliances, and the evening was

*This article traces the history of the organization from its inception to the present. A second article, which appears on succeeding pages, reviews the proceedings of the association, tracing the nature and value of the work it has done, and evaluating the influence it has had on maintenance standards and methods. A third article deals with the personal side of the organization and the men who have built it.



An Illinois Central Locomotive of the Early Eighties

devoted to a discussion of the exhibits. On the morning of the second day, the rail mill of the North Chicago Rolling Mill was visited, where the delegates were "astonished at beholding a rail 120 ft. long made directly from the ore in 40 min." At the afternoon session a list of subjects was approved for report and discussion at the first convention, which it was decided to hold at St. Paul, Minn., on September 15-17.

Before adjourning, the following resolution was adopted:

It is fitting, in concluding the first meeting of the Roadmasters' Association of America, to express in a special manner the great satisfaction felt heartily by every member present at the spirit of harmony manifested by the great railroads of this continent in the Railway Exhibition at Chicago. Joining hearts and hands, the masters of the iron arteries of the earth have searched in every clime and sifted every zone for objects of vital interest to railway men. Every appliance and device that the busy brain of man can contrive or conceive for the facilitating of travel and traffic by rail were there.

The curious and amusing relics of the railways' infancy were gathered there like the discarded playthings of a child long since grown to manhood; the triumph of ingenuity, the victories of inventive genius, the subtle thoughts of America's best brains moulded into cunning designs of iron and steel, all suggestive of yet greater triumphs in time to come—all these were there. No railroad man missed seeing this exhibition without irreparable loss to himself; none visited it without incomparable benefit in the way of new thoughts, new ambitions and new purposes.

A Pioneer Effort

It should be recognized that this association was a pioneer effort and that the men who organized it and piloted it through its formative days had little or no precedent to guide them. Furthermore, the membership was composed of men who had had no experience in association work, and only a few of them had any sort of technical education. It was fortunate, however, that they adopted the method of working through committees which made reports on subjects assigned for discussion at the conventions. This was in sharp contrast to the practice of working discontinuously through individuals, which was then, as now, followed by the American Society of Civil Engineers, the outstanding association of the period, with which it is clear that some of the founders were familiar, and which might have been expected, therefore, to provide a model for the infant association. The fundamental soundness of this method is evidenced by the fact that this is now the almost universal practice of the numerous railway associations of the present day. A study of the record leaves little doubt that much of the success of the association has been due to this fortunate choice, which was made on the day of formal organization, and which has been followed consistently since.

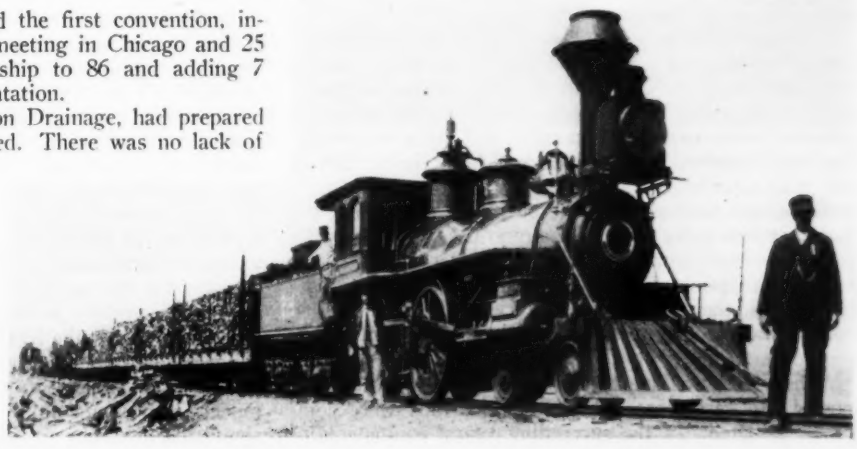
Forty roadmasters attended the first convention, including 15 who were at the meeting in Chicago and 25 others, bringing the membership to 86 and adding 7 roads to the previous representation.

Only one committee, that on Drainage, had prepared a report, and this was adopted. There was no lack of discussion, however, of the remaining six subjects which had been assigned. While the report on Drainage was under consideration, one speaker mentioned a steam ditcher which had recently excavated 1,600 ft. of ditch on both sides of the track in a single day at a cost of only $20. This statement, which is the first reference to labor-saving equipment, aroused so much interest that next day everybody in attendance went to see the machine which was on exhibition nearby, and the association formally endorsed it.

Track Laying Gang on the Burlington Near Oregon, Ill., in the Early Days

Impressions from Early Proceedings

One of the striking impressions gained from a perusal of the early proceedings was the uniform earnestness exhibited by those in attendance. Most of them were older men who had seen years of service and recognized the need for an interchange of ideas. They were open



A Construction Train on the Rock Island in Iowa in 1881

to conviction, but were extremely conservative in the reception of new ideas. Every subject had to be thrashed out and all of its implications examined with care. As has been said, they were individualists and they were obstinate in maintaining their positions in an argument. They were not trammeled by convention, but were outspoken in their discussions. As a result, while no ill nature is disclosed at any time, many forceful and pungent remarks and sharp retorts are in the record.

Industry is written large on the pages of the convention record. Few members who went to the conventions

This was the Main Track on the Rock Island at Des Moines, Iowa in 1881—Note the Stub Switches

missed any of the sessions. One or more night sessions were the rule, sometimes to insure completion of the program on schedule, when discussions were extended as they often were; sometimes for the purpose of discussing the manufacturers' exhibits; and sometimes to consider more fully a point which had aroused interest.

Many Changes in Track Structure

During the early years of the association, the subjects assigned for study, the reports and the discussions on the floor of the conventions all disclose the remarkable changes which were taking place in the track structure and in the maintenance field in general. Steel rails had largely displaced the iron rail of the earlier period but much of the latter was still in service on the lighter-traffic branches and in sidings, and many references to it are found. The older cast-iron and the later cast-steel frogs had been unable to withstand the service imposed on them by the heavier locomotives and cars, and rail-frog design was so recent that it was in a state of flux. Shop work was not exact and many of the new frogs were inferior in design and workmanship.

A similar situation existed with respect to joint fastenings. Probably nothing with which the members had to deal gave more trouble and no one seemed to know how to overcome the difficulty. A confusing array of patented joints were on the market, still more were ready for manufacturer and new designs were being turned out at an astonishing rate. Spring washers, or nut locks, were being substituted for the old fibre washer, but the fact that iron bolts were in common use, which was the cause of some of the joint trouble, had retarded somewhat the adoption of this device, although, like the joints themselves, there was a great variety of designs. One company advertised in 1891 that it had "sold 182,000,000 nut locks to date."

When steel was substituted for iron for rails, motive power and cars were light and 50-lb. rails were commonly adopted. In the succeeding years, equipment increased in weight, but the size of the rail lagged. As a consequence, roadmasters became greatly concerned about the future of the track, particularly as most of them were having much difficulty currently on this account. Rolling was often not accurate, the quality of the steel varied between rather wide limits and many of the rails were not properly straightened at the mill. As a consequence, rail and rail joints were subjects of perennial discussion which had a place on every program to 1897, in which year they were referred to the American Society of Civil Engineers, which was believed to be better equipped for investigating the whole subject, with a request that it work out adequate designs for the rail and fastenings.

Many roads did not have specifications for ties, while most of those that did were not enforcing them. As a consequence, this was one of the subjects which was given much attention and many were the sharp arguments which accompanied these discussions. As an indication of the forward-looking and alert character of the association and its officers, in 1890 an excellent report on wood preservation was presented in which the use of creosote as a preservative for ties was recommended.

Even at this early date the supply of timber was diminishing or had failed in many localities, while the forest areas of the Gulf states and Pacific coast were not yet available, except locally. For this reason, many roadmasters were much concerned about the tie situation and were then turning their attention to substitutes for wood ties. While there are not many references to the latter subject, there are enough to indicate the trend of thought. As to the future of the wood tie, however, there was much concern, and many speakers predicted that the day was not far distant when the timber supply available for ties would be exhausted.

Those subjects which have been mentioned were by no means the only ones which were studied by the young organization. Because of the aggravated conditions which surrounded the design, manufacture and use of these parts of the track structure, however, they occupied a major place on the early convention programs. The members had plenty of other things to consider, so that ballast, track tools, organization of the track forces, economics of track labor, rules for the conduct of work, switches, switch stands and other switch accessories, superelevation on curves, gage, the use of rail braces on curves and numerous other matters were subjects of study and, often, were sources of sharp argument and wide diversity of opinion.

Character of Program Changes

As the various conditions which were given this early attention were corrected or improved, many of them directly through the influence of the association, the character of the program changed. Widely divergent practices were brought to at least a semblance of standardization, while changing conditions eliminated the difference of opinion on others. As a result, more attention was directed toward the economics of maintenance and the study of more efficient methods. Still later, the widespread use of power equipment and the changes it has wrought in methods was reflected in the convention programs. Yet the association has never lost sight of the elementary matters connected with maintenance, so that more than one of the recent conventions have considered subjects that duplicate those of the earlier years. While the later reports and discussions have been based on the modern developments in maintenance, some of them sound like the echo of 50 years ago.

One of the striking features of even the earliest meetings is the dignity with which they were conducted. Robert's Rules of Order was adopted as the standard of procedure, and the requirements of parlimentary practice were rigidly enforced. In the heat of argument there was often some confusion and not infrequently several delegates were on their feet clamoring for recognition. The presiding officers held a strong hand over the proceedings, however, even though the argument waxed hot and some of the delegates got excited. These decisions were always accepted good-naturedly, and there is no evidence that an appeal was ever taken from a ruling of the chair.

Adherence to Work Still a Feature

It should not be construed, however, that these characteristics were lost with the passage of years, because adherence to work is still one of the outstanding traits of this association. In recent years more than one invitation for sight-seeing or a trip to some point of interest has been rejected on the ground that it would interfere with the work of the convention. Likewise, evening sessions are still the rule, for with the same earnestness of purpose which was exhibited in the beginning, the maintenance officers who now attend the conventions do not find room on the formal program to consider all of the subjects in which they are interested.

One basic and important change has taken place in the practice of holding conventions, which is in strong contrast with that of earlier years, and which has proved to be of definite advantage to the association. During the early years, partly because of the difficulty in securing transportation and partly to permit the delegates to see at first hand what other roads were doing, the successive meetings were held at widely separated points. The result of this practice was that, while a group of the more influential members was always present, the bulk of the attendance was local.

In recent years the attendance has grown to the point where only the larger hotels can provide the necessary accommodations, while only a few of these can offer adequate space for the track-supply exhibit which has always been such an important a feature of the conventions. For these reasons, as well as because experience has shown that more continuity of interest is engendered by holding the meetings at a central point, the recent conventions have been held at Chicago where ample accommodations are available for the sessions of the convention and the display of the exhibits of the Track Supply Association.

Rehabilitation of the association, after its period of partial exhaustion following the Denver meeting in 1898, brought a new era in committee work, which was lifted to a higher plane. In the years that have followed, particular attention has been directed to this phase of the work of the association, which has continued to improve until today it will compare favorably with that of any other body. At no time in its history have more exhaustive studies been made or more constructive reports been presented than those that were laid before the conventions of 1929 and 1930.

Preliminary Meeting Held at Niagara Falls

At this point we will return to the beginning of the association and follow its history as an organization through the period of development and more briefly through the later years to the present. The first of the preliminary meetings which preceded the formal organization, and from which it may be said that the association dates, was held at Niagara Falls, N. Y., in the spring of 1882. Four roadmasters were present, Isaac Burnett, J. H. Lindsley (C. B. & Q.), W. H. Courtney (L. S. & M. S.) and one other whose name is nowhere disclosed in the early literature, but who is presumed to have been M. J. McInarna (N. Y. P. & O.). It is quite probable that Charles Latimer, chief engineer, N. Y. P. & O., was also present as it is known that he took a definite part in the organization of the association and gave freely of his time and advice afterwards, until his untimely death on March 25, 1888.

Numerous other meetings were held, at Chicago and elsewhere, to enable these four to consult with the roadmasters in the different sections of the country. As a result of these efforts, the association began its formal existence with 61 members, which was increased to 86 at the first convention. Although the president sent out 2,800 circulars and letters of appeal during the first year, only 59 accessions were reported, while 9 were dropped for non-payment of dues, leaving a net membership of 136. The prospect was disappointing to the men who had given so much time and effort in trying to interest the 2,000 roadmasters of the country, but they did not lose courage or diminish their efforts, and in 1885 they were rewarded by a net increase to 232, at which time the success of the infant organization was definitely assured. By 1887 this number had grown to 348; in 1888, to 411; and in 1891, to 531.

A Step Backward

For several years thereafter, no membership figures or lists of members are given, but in 1898, Isaac Burnett made the statement on the floor of the convention that there were more than 600 members, while the current railway magazines said that the association "was never in so flourishing a condition." As the result of an ill-advised action taken that year, which will be discussed later, both membership and attendance at conventions slumped rapidly during the succeeding years, until in 1905 the roster shows only 361 names and only 35 attended the convention which was held at Niagara Falls, N. Y. There was a further recession to 232 members in 1909. During these years also the work of the association declined until it lost much of its value and its influence was at low ebb.

Poor Drainage Was a More Common Problem in the Early Days

Heroic efforts were necessary to bring the disintegrat-

ing society back to the place of influence and constructive value which it had so long held in the maintenance field. This work was undertaken by a group of devoted members who realized the irreparable loss which would result if an organization of such potential value were allowed to expire. A number of these men are still living, who remember vividly the labor and anxiety of those years of rehabilitation. The later history of the association and its present status in the maintenance field provide ample evidence that this work was well done.

Another indication of the thoroughness and success of this work, however, was the revival of interest in the association by the roadmasters of the country and the engineering officers who were engaged in maintenance. By 1912, when the efforts to bring the association back were bearing fruit, the roster shows 517 members prior to the convention while 130 were added at the meeting, making a total of 647. In 1916, this was increased to 786, while in 1930 the roster shows 831 active members, 33 active-retired members, 72 associate members and 7 honorary members, a total of 943. In considering these figures it should be borne in mind that there were often rather heavy losses, since failure to pay dues acted automatically to cancel the membership of the delin- automatically to cancel the membership of those members who were delinquent.

Qualifications for Membership

Mention was made in the beginning of the first legislation, with respect to its name, of the nascent society, and the statement was made that it disclosed an attitude of the membership. This referred particularly to the qualifications for membership. Neither the "rules", or constitution, and by-laws then adopted, nor the later amplification into a formal constitution and set of by-laws, contained any reference to qualifications for membership. They did, however, require applications to be made on a prescribed form in which the applicant stated that he was in responsible charge of so many miles of track on the road named. This application had to be approved by the Executive committee which was required to certify to the correctness of the statements "from its own knowledge". The application was then presented at a session of the convention, where five negative votes were sufficient to exclude the applicant from membership.

From time to time certain engineering officers who were interested in maintenance, and who recognized the value of the work the association was doing, applied for membership, and their applications were approved by the Executive committee, but they were excluded by a negative vote from the floor. This jealousy for the purity of the roster and the fear that it would be contaminated by the admission of "engineers" was evident on numerous occasions. Even Charles Latimer, who took such an active part in the organization of the society and helped it in so many ways during its first years, and whom the body as a whole literally loved, was not allowed to become a member, nor was he even accorded the compliment of honorary membership.

In 1889, after two applications from engineers who were engaged in maintenance had been rejected, W. F. Ellis (N. Y. P. & B.) offered a resolution looking to an amendment of the constitution which would permit them to join. This scheme was promptly nipped in the bud and his resolution was laid on the table. During this period technically-trained men were more and more entering the maintenance field. They also felt the need for some central agency where they could discuss their problems and by mutual action solve them. This sentiment finally crystallized into action and a definite movement was started to organize a new engineering and maintenance of way association.

This was the situation in 1898, although in the meantime there had been some relaxation and a few engineering officers had been admitted. An amendment to change the name to "The Railway Maintenance of Way Association" came up for action that year and, although it was warmly supported by Mr. Burnett, the founder, and by those members who had been most influential in the organization from the beginning, it failed of adoption by an overwhelming vote. Accordingly, the plans for the new engineering and maintenance of way association, now the American Railway Engineering Association, went ahead. With its birth there was a recession in interest in the Roadmasters' Association, which the reactionary element that was then in power could not overcome, the result of which has already been told.

Progress Again

It was nearly a decade before the ill-feeling then engendered subsided enough to give a clearer vision of the situation and enable those who had the interests of the older organization at heart to understand that there was ample room in the maintenance of way field for two strong associations which could be made supplemental instead of competitive.

With this conception a new growth was started. More liberal ideas began to prevail with respect to the qualifications for membership. It is still required, however, that an applicant for admission to active membership must be engaged in some form of track maintenance activity. The result has been that an increasing number of engineering officers have been admitted, until today they take an active part in the affairs of the association.

It should not be assumed, however, that this important change in the character of the membership has caused a radical change in the character of the association itself. It is today, as it has been from the beginning, an organization of roadmasters, the bulk of the membership is comprised of roadmasters and it is studying the problems of the roadmaster with as much interest and equal thoroughness as at first. It has lost none of its traditions; rather, it has added to them. It has merely demonstrated a flexibility in organization and procedure which will enable it to progress to a place of greater influence than would have been possible if the rigid and provincial ideas of the formative period had continued to prevail.

During the quarter of a century since its affairs were at low ebb, the association has regained the respect and influence which it had in the beginning. The value to the railways of its studies and conclusions has been recognized in many ways. Perhaps the most notable instance of this was during the difficult period of the World War, when the activities of many of the railway associations were purposely curbed. At this time the Roadmasters' Association was not only permitted to carry on as usual, but it was definitely encouraged to do so by the individual managements, by the American Railway Association and by the Federal railway administration.

Little remains to be said, except that during the last decade the association has had a still more vigorous growth, not so much in numbers as in accomplishment. It has not only kept abreast of the rapid changes which are taking place in maintenance practices, but it has had the foresight to study trends and thus prepare itself and the railways for the new conditions which must be met. It can be said as truthfully today as in 1898 that it "was never in so flourishing a condition".

The Roadmasters' Association Exerted a Strong Influence in the Attainment of the Present High Standard of Track Maintenance—A View in 4-Track Territory on the New York Division of the Pennsylvania

Fifty Years of Achievement

Through persistent efforts to solve its problems, the Roadmasters' Association has built up an enviable record of accomplishment and for half a century has exerted a powerful influence in railway maintenance

TO justify its existence, an organization must have an objective. To command respect and exert a measurable influence, it must have built up a record of constructive accomplishment. When an association has endured for half a century, and at the end of this period is still strong and virile, and is able to retain the loyalty and sustain the interest of its members, it is evident that it has set up for itself worth while objectives and that it has kept these objectives prominently and persistently in mind. That it has been able to command respect during this long period and is continuing to exert a wide influence in the field in which it is working, demonstrates that it is alert and that it has built up for itself a record of constructive accomplishment.

This, in brief, is the 50-year record to which the Roadmasters' and Maintenance of Way Association of America can point without reservation. Except for a brief period, this society, which was organized in 1882 as the Roadmasters' Association of America, has exerted a profound influence on maintenance of way methods and practices.

In an article on a preceding page, the history of this association has been told. The article that follows will set forth some of the contributions which this organization has made to the standardization of materials and the improvement of practices in maintenance. The third article, which appears on succeeding pages, will treat of the men who laid the foundations for the Roadmasters' Association and who built on these foundations throughout the half century.

The Roadmasters' Association was formed at a time when there were no organizations to consider matters relating to railway maintenance. Its members were practical men who had received their education in construction camps and on the track. Because there was no other agency, however, to do so for the first 20 years of its existence, the association was forced to give much of its attention to technical matters and to study and apply the principles of design as they were related to the materials and tools they were using.

To understand what the association has accomplished, especially during its early years, one must first visualize the conditions that prevailed in railway maintenance at the time it was organized. Some phases of the situation are given in an earlier article in this issue. They are understated, however, rather than overstated. There was on community of interest or uniformity of practice among maintenance officers. Methods had grown out of the individual experiences of these officers and, since a much looser organization and far less central authority prevailed in the engineering and maintenance of way departments of the railways in those days than at present, every roadmaster and chief engineer was largely a law unto himself. They had few outside contacts, so that, to a great extent, they followed their own ideas as to devices and methods. The consequence was that practices on different divisions of a single road often differed almost as widely as between roads.

In addition, fundamental changes were taking place in rail, joints and fastenings, frogs, switches, ballast, motive power and cars. Added to his other troubles, the roadmaster was faced with the fact that all work had to be done by hand, since no equipment for easing the burden of labor was available, except an occasional

home-made contrivance which he might be ingenious enough to divise. Tools were crude and many of those now in common use had not yet been thought of. The material and supplies that were furnished for his use were often poorly designed and in many cases the workmanship was inferior.

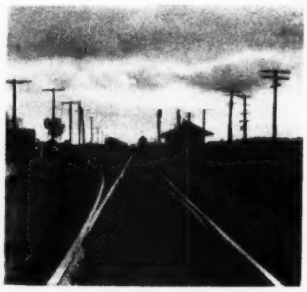
The Objectives Sought

This then was the situation when the Roadmasters' Association came into being. Its founders realized that this state of affairs could not continue without serious detriment to themselves as well as to the railroads. As a consequence, we find that their earliest efforts were directed toward bringing some semblance of order out of the chaos in which they found themselves. Standardization was one of the objectives of the infant association. There were other objectives also, some of which were dropped when they had been attained, while others have been set up as the need arose. Another, which has held a prominent place almost since the start and which is discussed at almost every meeting today, is greater efficiency in methods. Still others will be mentioned and the manner in which they were attained will be pointed out as we follow the record through to the present.

It was difficult at times, particularly during the earliest years, to reach agreement on subjects brought before the conventions, for the reason that there were often as many ideas about a matter as there were roadmasters in attendance, and each one fought valiantly for his opinion. Similar differences arose in committees, so that minority reports were not uncommon. In not a few instances reports were recommitted with instructions to compose the differences in the committees before they were again presented. These incidents do not disclose dissention, however, as the members were merely intent on solving their problems. Although the discussions were animated and long and the disputants were often outspoken, so that there were many sharp passages, there is nothing in the record to indicate ill nature on the part of those who took part in these discussions. As time went on and the railways began to realize on the results which the association was accomplishing, more unanimity developed and discussions became less spicy.

Rail Caused Much Uneasiness

One of the elements of track construction on which the Roadmasters' Association exerted a marked influence in its early days was the rail. For the first few years practically all of the members were from among the older men in the service. They were familiar with the iron rail which preceded the introduction of steel for rail purposes, and had seen the effects on that rail of the continued increase in the weight of locomotives and cars. The first steel rails approximated 50 lb. and, except on a few of the eastern roads, this was the size still in common use, although a few in the west had experimented with rails as heavy as 65 lb. The rails that were being furnished were not always satisfactory, since many of them were so badly kinked when they were received that they could not be used, and many roadmasters were severe in their criticism.



The photographs from which the illustrations were made on this and the following pages of this article were taken by Robert White, section foreman, Grand Trunk Western, Drayton Plains, Mich.

Train speeds and the weight of locomotives and cars were increasing rapidly while, in general, the weight of the rail remained stationary. There was, therefore, much uneasiness, particularly as these developments in speed and weight of equipment had recently been considerably accelerated. Isaac Burnett voiced this feeling in 1888, in a discussion of the need for heavier rail, when he stated that "within 10 years, locomotives have increased from 30 and 36 tons to 50 and even 70 tons. Pullman cars now weigh as much as 80,000 lb., and passenger cars as high as 70,000 lb., while freight cars are being built with capacities as great as 35 and 40 tons."

With this background and with full recognition of their lack of technical training but lacking any other agency to make the study, the roadmasters undertook a thorough investigation of the subject of rail sections which culminated in 1887 in a committee report which included designs for sections from 60 to 100 lb., and an urgent plea for standardized sections. As an indication of the divergent views which existed on the design of rail sections the committee expressed the "fear that the time has passed, if it ever existed, to bring engineers and manufacturers to unite upon a standard section."

This report created an uproar. While the delegates were convinced of the necessity for increasing the weight of rail, they literally gasped at the temerity of the committee in even suggesting the probability that 100-lb. rail would ever be needed. The discussion developed that one road, the N. Y. P. & O., of which Charles Latimer was consulting engineer, had recently adopted a section weighing 78½ lb. The representative of this road advocated the adoption of a section "somewhere between 75 and 90 lb. as the most economical."

The Discussion Was Heated

"Heavy rails are more difficult to tamp." "The heavier sections are too soft." "Get down and look along the rails and see how the running surface resembles ripples on water." "The light rails are kinking under traffic, we need a stiffer rail." "Wear is an important consideration, our 50-lb. rails were better than the 56-lb. rails, while the latter are superior to those which weigh 60 lb." "The heavy sections are so hard and brittle that they break when unloaded, even in soft ground. They may wear well, but I do not consider them safe." "I would recommend a minimum section of 75 lb." "My idea is that we should go to a 78 or 79-lb. section." "A 75-lb. rail will carry any traffic that will ever be imposed upon it." "If you increase the height you must increase the width of the base, which will then be so thin that you will have more broken rails." These are only a few of the pungent remarks that punctuated the heated discussion which consumed the entire day.

Partly in defense of the committee and partly in reply to one who advocated retaining the lighter sections, one speaker predicted the use of 100-lb. rail within the life of most of those present, a prophecy which was fulfilled within five years by two eastern roads.

Since there appeared to be no possibility of agreeing on the committee's report, owing to the fact that the membership was convinced that it was predicated on developments that were too far in the future, the differences were compromised by adopting a substitute

report which recommended a minimum section weighing 60 lb. This action stands out strongly, since it was the first action ever taken by an association to standardize rail sections. It did not satisfy the advocates of heavier rail, however, and this subject, in connection with other matters relating to rail, was debated until 1897, when it became evident that the complexities of the problem were such as to require more technical knowledge than was available within the ranks of the Roadmasters' Association and all questions relating to rail sections were referred to the American Society of Civil Engineers, which was the only society which then possessed sufficient scientific ability to carry the problem to a conclusion.

Chemistry of Rail Steel Was Studied

Equally outstanding in the early work of the Roadmasters' Association was its approach to the problem of fixing the chemical composition of rail steel. Owing to the wide variation in the hardness and wearing quality of the rails with which they were being provided, the association became interested in this subject at an early date and, in 1892, considered a comprehensive report in which the limits of the carbon content were fixed at 0.25 to 0.60, and of manganese between 0.60 and 1.60. The report said:

> Carbon, manganese and silicon are quite under the control of the manufacturer, but phosphorous and sulphur exist in the ores and fuel and are difficult to eliminate by the Bessemer process, so that the composition must conform to the limitations of phosphorous and the amount of carbon that is used. A general formula is not practicable and it would be to the best interests of the railways to specify the requirements of their service and leave the chemical composition to the manufacturers.

This report, which was adopted, recommended that the minimum section be increased to 70 lb., and also recommended the following distribution of metal in the section:

	Recommended by Roadmasters' Ass'n. in 1892 Per Cent	Average Distribution A. R. E. A. sections Per Cent
Head	43	36.6
Web	22	23.8
Base	35	39.6

For purpose of comparison, the average distribution of the present A. R. E. A. sections is also given.

Joints Were a Source of Much Trouble

Still another problem on which the association did pioneer work was the design of rail joints. The situation with respect to joint fastenings was probably more confused than any other with which the association had to deal. All of the designs then or previously in use, including fish plates, angle bars and patented joints, were unsatisfactory. Manufacturers and individual inventors were developing new designs in great number and all were loudly proclaiming the merits of their devices. Almost as many varieties of nut locks were on the market, but few of them had sufficient merit to survive.

Many roadmasters who had tried them and believed in them in principle, had gone back to the plain or iron-clad fibre washers until a better product could be developed. The iron track bolts, which were commonly used, added to the difficulties, owing to the fact that they stretched easily.

There was also a sharp division on the merits of supported and suspended joints. The proponents of each type, obstinately maintained that rail batter and surface kinks at the rail ends, with which they were having trouble, were reduced by the method of support which they advocated. This brought up the question of whether angle bars should be 24 or 48 in. long or some intermediate length. Opinion was about equally divided between four and six bolts for the joint. The association found itself unable to solve the difficult problems of designing a satisfactory type of joint, so that this question was also finally referred to the A. S. C. E., along with the weight and section or rail, in 1897, for the same reasons that dictated reference of the latter subjects.

These were matters which the Roadmasters' Association did not settle directly, but the discussions and the agitation which it kept persistently before railway managements exerted a powerful influence in the improvement of these parts of the track structure, which has continued to the present.

In connection with rail joints, there was frequent discussion of the merits of "square" and "broken" joints. Opinion was as sharply divided on this as on many other matters. Eventually, however, the advocates of square joints were won over and the practice of staggering joints, as recommended by the association, is now practically universal.

Another indication of the aggravating difficulties with which the trackmen of 50 years ago had to contend and of the problem faced by the association, was worn and unevenly gaged wheels, the effect of which was particularly severe on rails and frogs and scarcely less so on switches and guard rails. Since this matter was one that related primarily to equipment, it was referred to the associations representing the mechanical department and eventually corrected as a result of the insistence of the Roadmasters' Association.

Having disposed of the knotty questions relating to rail section and joint design by referring them to a society which was able to make a more exhaustive and scientific study, in 1898 the association turned its attention to the length of rails. About 1890, a few rails 60 ft. long had been laid as an experiment. During the intervening years a considerable mileage of 45-ft. and 60-ft. rails had been laid, some with square ends and some with mitred ends. The question arose in 1897 whether the association should recommend, as standard, rails of either length. A committee reported on this matter in 1898 but the association desired to study the matter further. In 1899, however, a year before the first convention of the A. R. E. A., it adopted a resolution rejecting the longer rails and recommended a length of 33ft. with square ends. This length was universally used for many years until conditions permitted a still further increase to 39 ft.

As a further evidence of the technical character of the work of the association, frogs and guard rails were among the earliest subjects that were studied. Cast iron frogs had been used by the early railroads, but as locomotives and cars became heavier, cast steel supplanted iron.

With the continued increase in the weight of equipment, the cast-steel frogs broke with about the same regularity that the older cast-iron ones had. At the time the association was formed, all-rail frogs were coming into general use, but practically no principles of design had been developed. The length of

the wing rails, the width and height of the point, the width of flangeways, the throat distance and width, the planing and, in fact, practically every feature of design, except the fact that there must be a point, a throat and flangeways, was a matter of opinion of the manufacturer or of the roadmaster who was to use them. Spring frogs had only recently been developed and the design of this type was in the same state of flux, while shop work was inaccurate and generally unsatisfactory. A similar situation existed with respect to guard rails. Since it was the only body that could bring order out of the confusion, the association tackled the whole subject with a will, and many features of the standards they then adopted are still in use, although the service requirements have increased many fold.

Spilt switches were displacing the stub switch, particularly on the eastern roads, although many of the latter type were continued in service for years. Turning its attention to this subject, numerous studies were made of switch design, riser plates, bridle rods, connecting rods, switch stands, etc., and not a few of the developments of today can be traced to the constructive work of the first 10 or 12 years of the association and the attention it gave to these matters.

Early Interest in Wood Preservation

It was natural that the association should show a deep interest in ties. This was one of the subjects assigned for the first convention, where the discussion included a consideration of substitute ties. A reference was also made to some "chemically-prepared" hemlock ties which had then been in service on the Chicago & Alton for 14 years, and which were still "perfectly sound, except where the rails had cut into them." This is the only reference to treated ties until 1888, when Robert Black (Manhattan Elevated) gave an extended description of the experiments which his company was conducting with vulcanized and creosoted ties.

Interest in this subject was aroused to the point where a committee was appointed to report at the 1890 convention on The Best Method of Preserving Ties. In making its study, the committee was so deeply impressed with the magnitude of the subject, its wide implications, and the absence of any agency to which it could look for information or help, that it recommended the appointment of a permanent committee to make a consistent study of the whole field of wood preservation as it then existed.

At this time there was much confusion as to the cause of decay and, therefore, of the proper methods of combatting it. One school insisted that decay consisted of slow combustion; another that it was caused by disintegration of the albumen constituent of the wood and that it could be prevented, or at least retarded, by coagulating the albumen through the application of heat, as in the vulcanizing process; while a few were advancing the theory that decay was caused by living organisms. In reviewing this phase of the matter the committee stated that:

> At the outset * * * we are confronted with a mass of chaotic and apparently conflicting data resulting from investigations, experiments and the views of eminent authorities, that are calculated to leave the novice in as much confusion as he formerly was in the dark.

As an indication of the clear thinking which characterized the association as a whole, the committee took the advanced position that decay is caused by living organisms and that the proper way to overcome it is to apply toxic substances to the wood, a view which was later confirmed by science.

As another indication of the activities and confusion of the period, the committee found that more than 100 patents had been issued covering preservatives and methods of applying them. Sifting these, it discusssed at some length Kyanizing (mercury chloride), Burnettizing (zinc chloride), the Bouchère process (copper sulphate), the zinc-tannin process and creosote The committee then presented the following conclusion:

> Creosote is the only preservative that meets all of the requirements, including resistance to the teredo, of a wood preservative, but it is also the most expensive.

To reduce this expense, the committee suggested, but did not recommend, a preliminary treatment with zinc chloride, to be followed by a further, but lighter, treatment with creosote.

The following year a further report on the preservative treatment of ties also contained suggestions for selection, cutting, storing and caring for ties, which compare favorably with the recommended practice of today. These reports received widespread attention and aroused an active interest among managing officers, particularly with reference to the possibilities of adding to the life of the ties and thus reducing the annual cost of this important element of the track structure.

Tie specifications and standard sizes for ties were also subjects of study for many years, and recommended practices were adopted. While these recommendations were never accepted universally, and definite standards were not adopted by the railways as a whole until recent years, the studies which were made, like those with respect to preservative treatment, had a wide influence in improving the quality of the ties and in bringing practices into some semblance of order.

Standards for Track Tools Adopted in 1895

Still another ramification in the work of the association throughout its career related to the design of the tools used by its members. Owing to the wide diversity in the tools employed throughout the country, there was more or less discussion of this subject from the beginning, but in view of the many other major matters requiring attention, it was not until 1893 that an intensive study was given to tools. After two years of investigation, the Committee on Track Tools then brought in a comprehensive report, with recommendations, which with a few minor amendments, was adopted. Among other things the committee found numerous forms of track levels in use, but rejected them as unsatisfactory and presented a design of its own having a graduated end, which permitted the superelevation on curves to be given accurately, a feature which none of the existing levels possessed. Exactly similar levels are in use today, while the basic principles which were embodied are now standard with all levels.

Likewise, a design for a spot board and surfacing blocks, substantially the same as those now in common use, was also prepared. This was approved but not adopted as a standard, since it had been patented by a section foreman named Sponenberg, about whom no further information is given. Other tools dealt with in the report included the track chisel, sledge, spike puller,

lining bar and track wrench. The designs, which were then adopted, do not differ in any essential respect from those now in common use on the railways. The only recommendation of the committee that was rejected was for a straight wooden gage. This matter was reassigned for further study, but was not again brought before the convention in the form of a report.

The Record Changes in Character

As a result of action taken at the convention in 1898, which is explained in detail in the preceding article, for nearly a decade subsequent thereto, the work of the association declined noticeably in character and lost much of the value which characterized the earlier years. By 1912, however, a new generation had appeared, with a background differing from that of the men who had been identified with the association in the beginning. Partly for this reason, partly because many of the difficulties which had confronted the maintenance men of the earlier day had been eliminated, largely through the efforts of the association, and partly because by general consent, subjects of a more technical nature were relegated to the consideration of other associations which had been formed for their special consideration, the character of the record changed somewhat.

During the last 20 years greater attention has, therefore, been given to the broader aspects of maintenance, to the economics of labor and materials, to refinements in methods, the matters relating to safety and to new practices which have been developing. Furthermore, the introduction of power equipment in maintenance, the improvements which have been made in drainage, the almost universal use of treated ties, the application of tie plates and anti-creepers and numerous other developments have produced profound changes in maintenance, of which the association has kept abreast, and which have provided subjects which have had a prominent place on convention programs. More than one convention has set aside a part of its program for the special consideration of new devices and their effect on methods.

The association has also done much to stimulate thought on gang organization. Difficulties in securing capable foremen led to a report in 1912 on the training of men for this position, following which the association approved the committee's recommendation that definite steps be taken toward educating men for foremen, and that a minimum of four student foremen be maintained for every 25 sections. Further studies culminated in a splendid report in 1929 on The Selection and Training of Foremen, in which were recommended frequent joint meetings between supervisors, foremen and assistant foremen, track inspections with the award of prizes and the encouraging of the reading of up-to-date periodicals. While the railways have not adopted all of these recommendations as a general policy, the action and persistent pressure of the association has had a definite influence on the trend of thought of railway managements.

While safety matters were not ignored during the early years, it was not until 1913 that a comprehensive report was made on safety in maintenance work, since which time this subject has had a prominent place on many programs. No better report has ever been presented to any body than that on The Correction of Unsafe Methods in Track Work which came before the meeting in 1929. The constant pressure exerted by the association, in joint effort with other agencies, has produced results in decreased injuries which the most optimistic would not have predicted 20 years ago when the subject was first assigned.

Nowhere has the association exerted a greater influence than in the stimulation of the use of power equipment. It was not until 1914 that a formal report was made on the use of such equipment in maintenance, although about 12 years earlier a paper relating to gasoline motor cars was read at one of the conventions. This report dealt with section motor cars, rail cranes, power rail benders and curves, three-men track layers, snow-melting equipment, ditching machines, pneumatic tools and mechanical tie tampers. The latter was such a new development that it was not discussed at length in the report, but the statement was made that it was a step in the right direction and the committee predicted that when it was perfected, it would "solve the difficulties under which we are working."

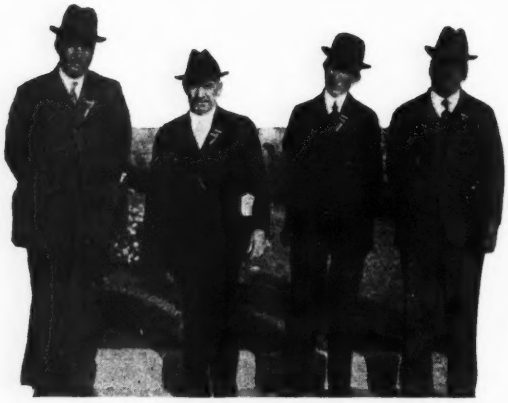
The advantages of the use of section motor cars were stated and an estimate was made of the economies which they might be expected to demonstrate. The committee also recommended the general adoption of this equipment for section use as well as the "general adoption and installation of power-driven machines and tools for all work pertaining to the building and maintaining of tracks." With some minor amendments this report was approved enthusiastically. This was the beginning of the deep interest which the association has taken in power machines, in the general adoption of which it has had a very marked influence.

During the period of the World War new conditions arose almost over night, so that during these years the association directed its attention to such questions as organizing the maintenance forces, best methods of performing track work, seasonable distribution of maintenance, the equating of track values, methods of securing and retaining track labor, methods of inspecting ties in the track and recommendations for renewal, the problem of material and supplies, the housing and feeding of maintenance of way employees and numerous other subjects which arose out of the dislocation of industrial and economic conditions. Out of the intensive studies of that period, however, grew numerous practices and refinements of practices which have endured to the present. While it is difficult to analyze and follow through the later years the influences which had their inception during this period, there exists no doubt in the minds of those who are most familiar with the work of the association from 1917 to 1922, that many of the practices of today, many of the economies which are being observed, and much of the effectiveness of labor can be traced to the work of the association during the dark days of the war and the period of readjustment that followed.

Accomplishment of the Last Decade

As an event, or series of events, recedes, it becomes correspondingly easier to evaluate it. When one is close in point of time to its occurrence, there are often so many cross currents that arise from other sources that it is difficult to give the proper weight to all of the factors. An exception to this general theorem was a short but important report on Section Gangs vs. Extra Gangs which was presented in 1922. This report contained the first mention of the possibility of increasing

(Continued on page 616)



The Men Behind

The human element in the story of the Roadmasters' Association—An insight into the personalities of some of its founders and others who shaped its career

IT IS said that every institution is an extended shadow of some man or group of men. This is true of the Roadmasters' Association whose outstanding contribution to the development of efficient maintenance practices is due in large measure to those men who laid the foundation of the association and to those of later years who have provided the leadership that has brought the association to its present eminent position.

When the Roadmasters' Association was organized 50 years ago, the roadmaster was a big man on his division. When other departments of the railway wanted something done, he was consulted. He was the company's representative in the community. He settled personal-injury and property-damage claims. Not infrequently he acted as purchasing agent, buying his own ties and contracting for the lumber that was needed for constructing and maintaining bridges and buildings. He took charge at wrecks and during floods or other disasters. He not only performed all of these duties, but he did a good job of it. Loyalty, initiative, dependability and a tendency to mind his own business were outstanding traits.

Personality of the Founder

Such a man was Isaac Burnett to whom the credit is due more largely than to any other one man for the vision, initiative and untiring effort which made the Roadmasters' Association possible. He had unusual ability and vision and possessed a strong and attractive personality which made him a leader among his fellows. He started his railway career as a track laborer on the Wabash, St. Louis & Pacific, now a part of the Wabash. Promoted to section foreman, he had the good fortune to serve under R. R. Houghton, a roadmaster who was noted for his interest in young men and for the number of high grade trackmen he turned out. About 1867 Mr. Burnett was appointed roadmaster on the Chicago, Rock Island & Pacific, where he remained until 1887 when he left railway service to enter the railway supply field, associating himself first with the Joliet Steel Company, Joliet, Ill., and from 1895 until his retirement in 1904, with the Q. & C. Company at Chicago.

Stimulated by his general superintendent, Abel Kimball, he became active in interesting roadmasters on the Rock Island and other roads in the idea of forming an association. He acted as chairman and president of the preliminary organization and was elected president at the first convention, serving in this capacity for three years and later as first vice-president for three years. Presumably at the suggestion of Charles Latimer, it had been decided by the founders to carry on the work of the association by means of committees, and this fact is mentioned in Mr. Burnett's speech at the opening of the first meeting in Chicago on June 13, 1883.

Mr. Burnett exerted a powerful influence in the affairs of the association until about 1900, when owing to his age, he became inactive and subsequent to 1904, attended only a few conventions. The last time he was mentioned in the record was in 1912, when a letter from him expressing his continued interest in the society was read by the secretary.

No review of the men who laid the foundations of the association would be complete without mention of Charles Latimer. Although he never became a member, Mr. Latimer probably exercised more influence in the direction of the affairs of the society during the first five years than any other person except Mr. Burnett. He had been chief engineer of the Atlantic & Great Western and was chief engineer and later consulting engineer of the New York, Pennsylvania & Ohio, its successor (now part of the Erie) and was rated as one of the most intelligent and progressive maintenance officers of his time.

Finding himself greatly hampered by the confused maintenance conditions of the period, he had formed a local association among the 12 roadmasters on his road, with a view to standardizing and improving their practices. Under his direction this small association did its work through committees, whose reports were thoroughly discussed at the meetings and conclusions adopted. The proceedings were printed, and apparently had a wide circulation among railway officers. It was largely a result of his experience that the same plan was adopted by the Roadmasters' Association. He continued in his advisory relation and was a powerful factor in stimulating interest and directing the studies of the association until his sudden death in 1888.

Two Other Strong Characters

It is not possible to make extended mention of all of the men who were influential in the work of the association during the formative years, but attention must be called to two of the strong men of those years, who left the imprint of their personalities definitely on the organization. These were Captain J. W. Craig of the Charleston & Savannah, and H. W. Reed of the Savannah, Florida & Western. Captain Craig was a typical southern gentleman of the period, and although he came from a road that could boast only 112 miles of line, his modest but forceful character and his intelligent interest in track maintenance so impressed those present that he was elected second vice-president in 1884, the year he joined. Re-elected to

*This is the third of a series of articles in this issue depicting the rise of the Roadmasters' Association. The first article presents a historical review of the association's activities; the second article portrays its achievements, while this article relates to those men who have contributed most largely to the success of the organization.

the Record*

Nine Past Presidents of the Roadmasters' Association Whose Terms in Office Embrace a Period of 20 Years. From Left to Right, Beginning on the Opposite Page, they Are: P. J. McAndrews (1915), M. Burke (1917), Coleman King (1916), A. Grills (1918), James Sweeney (1910), J. B. Kelly (1927), T. Thompson (1911), T. F. Donahoe (1914) and H. R. Clarke (1929)

this office, he succeeded Isaac Burnett and also served for three years as president. He ruled the sessions with an iron hand, but in a friendly way and is remembered today by some of the "old-timers" as a man of high attainments.

H. W. Reed, also from the South, served for seven years in various capacities from member of the Executive committee to president. He was more suave in word and manner than any other of the early members and it was often his quiet voice which supported the president when the debates grew too exciting. His specialty on the convention floor, as well as behind the scenes, was to compromise differences during the long debates, when the discussions often wandered away from the subject under consideration. He was the author of the substitute report in 1887, which was adopted as the first well-considered action of any organization to standardize rail sections.

So many others took important parts in the early activities that only a few of them can be even named. These included George E. Cain (ST. L. Merch. Br.) and R. R. Houghton (W. ST. L. & P.); W. H. Courteney (L. S. & M. S.) and J. H. Lindsley (C. B. & Q.), two of the founders; Tim Hickey (M. C.), who also assisted in founding the society; John Doyle of the same road, "silver-tongued orator from Michigan"; John Sloan (O. I. & W.); J. Kindelan (C. M. & ST. P.); W. F. Ellis (N. Y. P. & B.); Robert Black (Manhattan Elevated); R. Caffery (L. V.); O. F. Jordan (M. C.), of spreader fame; J. M. Meade (A. T. & S. F.); J. H. K. Burgwin (G. R. & I.); J. B. Moll (C. M. & ST. P.); M. J. McInarna (N. Y. P. & O.); and many others who combined to give the young organization its strong character.

A New Generation in Control

As these men passed from the stage through death or retirement, about 1898 a new group, somewhat reactionary, came into control, as referred to in the first article. Passing over the years during which the activities of the association declined, we come to the period of rehabilitation which began about 1907, but which did not gather sufficient momentum to bring measurable results and assure a successful future for the association until 1912. Both before and subsequent to 1900 a number of younger men were joining the society, who were not in sympathy with the methods that were being followed in its management, but who did not then form a group of sufficient strength to assume control.

Chief among these were E. C. Buhrer (T. & O. C.), A. M. Clough (N. Y. C.), W. M. Camp (Railway Review), P. J. McAndrews (C. & N. W.), L. C. Ryan (C. & N. W.), Wm. Shea (C. M. & ST. P.), James Sweeney (C. & E. I.), T. Thompson (A. T. & S. F.) and E. E. R. Tratman (Engineering News). Probably no better expression of the attitude of these men can be presented than by quoting a passage from the diary of Mr. Clough, who recorded his impressions of the meeting at Niagara Falls in 1905.

> I and only four others were admitted to membership at this time. While I had attended conventions before as a visitor, and had seen what I considered both energy and interest displayed during the sessions, I shall never forget how my heart dropped when I looked across that large assembly room and saw only 35 grizzled warriors of the tracks. I made a vow on that spot that whatever was the cause of the lack of attendance, lack of interest and generally woe-begone air of that assembly, I would do what I could to correct the situation. I could forsee a continuation of the trend toward larger cars, larger engines and heavier rails and, consequently, a greater need than ever before for similar meetings and deliberations. I vowed that I would bend every effort to help the association get back on its feet and then to keep it there.

Messrs. Buhrer, Camp, Clough, Shea, Sweeney, Thompson and Tratman formed a determined group, but were so small a minority that for a time they made little headway against the general indifference which had seized the membership. In 1907, however, they were reinforced by Mr. McAndrews, in 1908 by Mr. Ryan and in 1910 by Messrs. J. P. Corcoran (C. & A.) and T. F. Donahoe (B. & O.). Through their combined and persistent efforts, the society was finally restored to its former healthy condition.

Although Mr. Camp was never an active member of the association, he took a deep interest in its affairs and exerted a powerful influence when a steady hand and clear thinking were so badly needed. He was elected to honorary membership in 1907 and continued his interest through the troubled days of the war period and until about 1920, when he retired.

Likewise, Mr. Tratman was not an active member, though active in his interest in the association. He was made an honorary member in 1899, partly in recognition of his published work on track maintenance and also in appreciation of the value of his counsel during the days when engineering advice was so sorely needed by the association.

In addition to the results which this group was able to accomplish in reanimating the association, a further evidence of the ability of the individuals which composed it and of the influence which they have exerted is found in the fact that every one of them has since held important offices in the association. James Sweeney, who has the distinction of being one of the two oldest active members, has held every office except that of secretary and for the last eight years has acted as treasurer. Mr. Thompson, who follows in point of age, also succeeded Mr. Sweeney as vice-president and then as president. J. A. Kerwin, who in his later years was on the C. P. & ST. L., was a member of this group, although he joined as a young man in 1885. He never lost his interest and attended every

convention until prevented by physical disability.

Coming to the younger men, "Andy" Clough, who took the vow in 1905, the year he joined, to do his utmost to further the interests of the association, has never relaxed his efforts and is the same enthusiast and wise counsellor as he was a quarter of a century ago. No convention today is considered complete without his presence to offer the invocation and to install the new officers. The society also owes a debt of gratitude to Messrs. Ryan, McAndrews, Donahoe, Buhrer, Corcoran and Shea, the first three of whom have successively filled the office of secretary since 1912, while Mr. Corcoran has filled every office except secretary and treasurer. Mr. Buhrer, who was president in 1906, is now a member of the Executive committee. Mr. Shea was president in 1912 and has been very active in promoting the interests of the society since.

During the two decades that have followed the assurance that the association was returning to its former place of usefulness and influence, many men have appeared on the membership roll, who have had a hand in shaping the policies and improving the work of the society. Because of their number, space does not permit even passing mention of most of them, but only of those who have worked the longest and who are now active in guiding the association through the difficult days that are confronting it.

Included among the men who have not already been mentioned, but who are at present influential in the association, and are continually working in its behalf are past presidents W. P. Wiltsee (N. & W.), L. M. Denny (C. C. C. & ST. L.), J. B. Martin (N. Y. C.), W. F. Muff (A. T. & S. F.), G. W. Morrow (I-R Co., formerly on the N. Y. N. H. & H.), J. B. Kelly (M. ST. P. & Ste. M.), whose father was a charter member, J. P. Davis (C. C. C. & ST. L.), H. R. Clarke (C. B. & Q.) and E. E. Crowley (D. & H.). These men are mentioned in this order because it is the order in which they have served as presidents of the association. To them must be added the present official portfolio, Elmer T. Howson, president; C. W. Baldridge, first vice-president; and J. J. Desmond, second vice-president.

It is not possible to say what will be the ultimate influence on the association of these men, whether they are considered as individuals or as a group. This is a matter that only time can tell. This much we are certain of, however, that when economic conditions have improved, its achievements and influence will assume still greater importance under the inspiration of the many men who are so deeply interested in its success.

Better Results With Relay Rails

By JAMES I. PURICH

Extra Gang Foreman, Canadian Pacific, Chapleau, Ont.

RAILS released from track when relaying out of face should be classified before loading, as this will save much rehandling later. The classification should be indicated by marking each rail with paint according to the established rules of the railroad. It is also a good practice to load any one car with rails from only one side of the track and make a record showing from which side of the track the rails were removed. Then, when these rails are moved to another location for relaying or are sent to the rail saw plant and later shipped out for relaying, it will not be necessary to turn any of them end for end. This will result in a considerable saving, as it takes 16 men with tongs about twelve minutes to lay 33-ft. 100-lb. rails if they have to be turned, while the same gang can do the work in five minutes if no turning is necessary. There is, of course, a corresponding loss of time for turning rails if they are laid with a crane.

Time can be saved, also, if rails released from curves are marked in the order of their positions in the curve. This is especially true of badly worn rail that has already been changed over from the low side to the high side of the curve and has had battered ends built up by welding; in other words, rail that is suitable for use only in secondary or slow-speed tracks. Such rails should be marked with white paint on the web about two feet from one end, the first rail at one end of the curve being marked (1), the second one (2), and so on around the curve. In addition, each rail should be marked with a letter to indicate the curve from which it was removed, say, (A) for the first curve, (B) for the second curve, etc. In this way the rails can all be identified and relaid in regular order to obtain smoother riding track than if they are relaid without regard to order.

Fifty Years of Achievement

(Continued from page 613)

the length of sections, of confining section gangs to routine maintenance only and of organizing larger specialized gangs to perform the heavier tasks of maintenance. While in a way this report supplemented an earlier report which has been mentioned and was the culmination of an idea that had its inception in that report, it went further and was specific in its recommendations that the maintenance forces be reorganized in this manner. The results of these recommendations, which were approved, can be seen in the reorganizations that numerous roads have recently made in their maintenance organization and which are still in progress.

While some of the recent studies which have been made by the association are already bearing fruit, the ultimate influence which they will have on railway maintenance can only be determined in the future. The continued study of the subjects which have been under consideration since 1924, several of which have been embodied in successive reports, cannot fail to have a cumulative effect. To mention only a few, these include the education and development of track foremen, means of reducing work train service programming section work, means of prolonging the life of rail, methods and cost of weeding tracks, uniform forces throughout the year, collection and use of cost data by supervisory officers, reduction of material stocks, economics of heavy track construction, defects in rails and numerous others.

Probably no better evidence can be given of the present virile condition of the association and its state of preparedness to continue the constructive work which was begun half a century ago by the small group of earnest men who lived in a period of so much confusion, than to refer to the committee reports and ensuing discussions of 1929 and 1930. These reports, and the addresses during the sessions, were of the highest order and were worthy of any body of men. The discussions which followed were to the point and indicated an alert intelligence on the part of the membership which augurs well for the future of the organization.

Only a few of the accomplishments of the association have been mentioned. There were many more, and perhaps another student of the record would have made a different list. In any event, the present membership can feel a deep satisfaction that it is a history of constructive effort and definite results. This knowledge should act as a spur to still greater achievement and influence in its field of work.

The Track Supply Association Dinner in 1921—Co-operative Functions of this Type Have largely Eliminated any other Forms of Entertainment

The Track Supply Association—

A Valuable Ally

How the relations of the roadmaster and the manufacturers led to the organization of the latter into the present effective educational agency

MAINTENANCE of way involves the application of tools and machinery to the upkeep of the track structure and the roadbed on which it rests. It involves judgment and discrimination not only in the adoption of the most effective methods but also in the selection of the most efficient appliances. It is not surprising, therefore, that roadmasters, meeting each year at conventions to discuss their problems, should take as much interest in appliances as they do in methods, and that they have welcomed the opportunity afforded them to study devices, tools and materials placed on display at a "Track Supply Exhibit."

That there is nothing new in this idea is evident from a statement in the report of the second annual convention of the Roadmasters' Association, published in the Railway Review of September 20, 1884:

> "At one end of the convention hall, tables were provided for an exhibition of appliances connected with the maintenance of way."

A list of exhibitors followed, but the list published in the Railway Age of September 18, 1884, appears to have been more complete and is reproduced below:

Full size rigid frog Ajax Forge Company Chicago	Gould's improved rail joint W. F. Gould Des Moines, Iowa
The Lamberton wrecking frog Sherman & Lamberton	Hydrostatic Car & Track Jacks Hoglund & Jackson Anderson, Ind.
The Gale switch	The Iron City nut lock Gibson Whaley
Hart's frog E. S. Hart Clinton, Iowa	The Fowler spike Fowler Rolling Mill Co. Chicago, Ill.
Van Dusen nut lock Peerless Manufacturing Co. Louisville, Ky.	Track washers Vulcanized Fibre Co. Wilmington, Del.

Thus we find that an "exhibit of appliances connected with maintenance of way" was a feature of the Roadmasters' convention forty-eight years ago, or only a year after the association became a definite reality. It is significant also, that exhibits have been presented at every succeeding convention except two, namely, those at Chicago and St. Louis, during the world's fairs of 1893 and 1904, respectively.

"Inventors and Manufacturers"

The representation at the 1884 exhibit included only a few of the widely known manufacturers of the time, and for a number of years many of the devices shown were the product of individual inventive enterprise, as indicated in a report of the convention in 1885 to the effect that "There was a considerable attendance of inventors and manufacturers at the convention." However, even at that early date the exhibitors included the Pennsylvania Steel Company; the Bucyrus Foundry and Manufacturing Company; Fairbanks, Morse & Co.; the Crerar Adams Company; Metcalf, Paul & Co. (sales agents for the Verona Tool Works); the Wier Frog Company; and the Cleveland Frog and Crossing Company, in addition to some of the firms that had exhibited the year before. To these were added, in 1886, the Kalamazoo Railroad Velocipede Company, the Sheffield Velocipede Company, the Buda Foundry & Manufacturing Company, and the Ramapo Iron Works. The National Lock Washer Company, and Pettibone-Mulliken & Co. made their first appearance in 1888; Joyce, Cridland & Co. and the Indianapolis Frog & Switch

Company in 1889; and the Morden Frog & Crossing Works in 1890.

These names are evidence enough of the character of the appliances and materials placed on display, although added to these, as previously mentioned, were not a few untried inventions relating largely to nut locks, rail joints and switches. The Marion Steam Shovel Company was first represented at Cleveland in 1887, and the Rotary Steam Plow Shovel Company at Washington in 1888, although the latter had been demonstrated at the first convention previous to any attempt at a formal exhibit.

Exhibitors Organized in 1891

Until 1891, exhibits were conducted with little or no attempt at organization on the part of the firms represented. But it is apparent that the need for a coordination of their efforts had been felt for some time, for in that year, at the convention at Minneapolis, the exhibitors organized the "Roadway and Track Supply Association," a resolution stating that "The object of the Roadway and Track Supply Association of America shall be to secure to its members reasonable rates for hotel accommodations while in attendance at conventions, provision for proper display of the devices of exhibitors at such conventions and to secure such reductions in cost of transportation as the numbers attending may warrant."

The officers of the association were: President, William S. Brewster, Truss Rail Joint Co.; vice-president, William Goldie, Sr., Dilworth, Porter & Co.; secretary, W. W. Snow, Ramapo Iron Works; and treasurer, H. S. Paul, Verona Tool Works. Among other officers in the early years of this organization were W. W. Salmon, Hall Signal Company, who was elected secretary in 1892 and president in 1893; A. J. Cowling, Buda Foundry & Manufacturing Company, elected secretary in 1893; and J. Alexander Brown, elected secretary in 1898. Among others whose names appeared prominently as representatives of the manufacturers, in those early days, were E. S. Hart, Rodger Ballast Car Company; A. W. Thompson, Continuous Rail Joint Company; C. F. Quincy, Q. & C. Company; R. J. Davidson, Ramapo Iron Works; T. W. Snow, Pennsylvania Steel Company; George F. Akers, Fairbanks Morse & Co.; B. F. Bradley, Morden Frog & Crossing Works; J. R. Ellicott, Ajax Forge Company, and James C. Ball, Pettibone-Mulliken Company.

Early Exhibitors Encounter Problems

It is clear that the primary object of this association was that of facilitating the conduct of an exhibit; in fact, it was the difficulty of obtaining suitable exhibit space at reasonable rates that fused the exhibitors into an effective co-operative agency. In view of the problems that have confronted the Track Supply Association in recent years in finding adequate exhibit space close to the convention hall, it is of interest to note that as early as 1889, when meeting at Denver, Colo., and again at Atlanta, Ga., in 1892, it was necessary for the exhibitors to lease space in vacant store buildings to display their wares, while at Detroit, Mich., in 1899, part of the exhibit was presented out of doors. Those who attended the convention at Kansas City, Mo., in 1925, when the exhibit was held in the municipal auditorium, will appreciate the disadvantages of such arrangements.

The Roadway and Track Supply Association was confronted with a serious problem also by reason of the heavy expenses incurred in presenting exhibits at widely scattered locations throughout the country, because of the manifest desire on the part of those who directed the affairs of the Roadmasters' Association to avoid centrally located cities as the place of meeting. When, therefore, the Roadmasters elected to hold a convention at Los Angeles, Calif., in 1900, the supply association abandoned plans for an organized exhibit, although about 11 companies did put in an appearance. This number is to be compared with 43 exhibitors at Denver in 1899.

The Roadway and Track Supply Association, however, resumed its activities in subsequent years and continued to conduct exhibits until 1908, when "out of fear that there would be a poor attendance at the convention at Milwaukee," a surmise that proved highly accurate, it was decided not to participate as an organization, although 33 firms exhibited as individuals. The same position was taken the following year at Washington, in spite of which 16 supply companies exhibited. This second repudiation of its action on the part of individual members seems to have rung the death knell of the Roadway and Track Supply Associaton, for it was never heard of again.

Apparently it was not until then that many members of the Roadmasters association came to appreciate what an important part a well-organized and conducted exhibit played in the success of the convention. This is shown by the serious consideration that was given at the convention in 1909 to a proposal to hold the 1910 convention at Chicago during the same week in March in which the convention of the A.R.E.A. was scheduled, in order that the members might secure the benefit of attendance at the concurrent exhibit of the National Railway Appliances Association. As a matter of fact, a resolution to this effect was passed, but was later reconsidered and voted down before the close of the convention.

Exhibitors Again Organize

Perhaps this action gave the necessary encouragement for another attempt at organization. However, it had become clearly evident to a group of men identified with the manufacturers that a closely knit association of the exhibitors was necessary if both the convention and the exhibit were to fulfill to the greatest extent the objectives for which they were held. Accordingly, at a meeting held on September 16, 1910, during the course of the Roadmasters' convention at Chicago, a new organization, the Track Supply Association, was brought into being with the following officers: President, William Goldie, Sr., who had been a member of the older association; vice-president, J. M. Holloway, American Steel & Wire Company; and secretary-treasurer, H. C. Holloway, Rail Joint Company. This new association presented its first exhibit at the convention at Buffalo, N. Y. in 1911 with a commendable showing, but it was not until after the business meeting held at that time when W. C. Kidd, Ramapo Iron Works, A. H. Weston, Lackawanna Steel Company, and F. A. Preston, P. & M. Company were elected president, vice-president and secretary, respectively, that the supply association was given the impetus necessary to make it a genuine success. Henceforth it grew rapidly. There were 39 exhibitors in 1912, 46 in 1913 and 51 in 1914, and under the leadership of Mr. Kidd, who served for many years as secretary, Mr. Preston who served as president in 1916 and Mr. Weston who was president in 1913, the Track Supply Association became an established institution of rapidly expanding influence. Among others who gave their

active support in the work of building up this new institution were W. H. Allen, Pennsylvania Steel Company, who served as president in 1914; and E. M. Fisher, Fairbanks, Morse & Company, who was elected to the presidency in 1915.

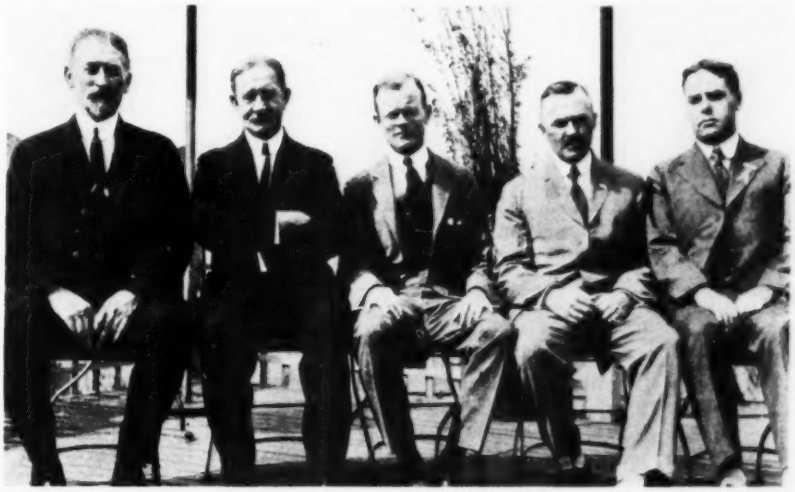
"Captain Kidd"

Special mention, however, must be made of W. C. Kidd, who was elected secretary in 1912 and continued to serve in that capacity until he was compelled to relinquish his duties by illness that resulted in his death in 1927. Possessed of an unusual personality and a remarkable memory for names and faces, he won the friendship and esteem of supply men and railway men alike, and exerted a profound influence in the conduct of the affairs of both associations. For example, at times when certain groups were fostering a movement to hold the next convention at some remote point, his appearance on the floor of the convention only long enough to say, "I don't care where you meet so long as it is Chicago," was often all that was needed to forestall ill-advised action. While he was not individually responsible for the policies that made for the success of the Track Supply Association, the task of carrying them out fell largely on his shoulders, and he never faltered in his duty no matter how disagreeable the task might be.

During the period of development following his election to office, the Track Supply Association prospered. It increased its membership from 30 firms in 1911 to 68 in 1930, its value as an educational medium was likewise improved; representation on the part of fly-by-night companies (whose primary objective was selling securities rather than devices) became less and less frequent; objectionable practices in exploiting wares virtually disappeared; but most important of all, the machinery for the conduct of the exhibit was so thoroughly perfected as to be of maximum benefit to the manufacturers and railway men alike.

As the years went by, others became identified in the work of the supply association and had an important part in the attainment of its objectives. Among these are the following who have served as president, in addition to those previously mentioned.* Edward Coleman, representing the American Hoist & Derrick Company; R. A. Van Houton, Sellers Manufacturing Company; Elmer T. Howson, *Railway Engineering and Maintenance*; W. H. Armstrong, Ingersoll-Rand Company; D. T. Hallberg, P. & M. Company; Alex Chapman, Rail Joint Company; F. M. Condit, Fairbanks, Morse & Co.; J. J. Cozzens, Union Switch & Signal Company; L. C. Ryan, Oxweld Railroad Service Company (who has been secretary since 1928); A. H. Told, Positive Rail Anchor Company; J. Howard Horn, National Lock Washer Company; F. E. McAllister, Kalamazoo Railway Supply Company; L. P. Shanahan, American Steel & Wire Company; and D. J. Higgins, American Valve & Meter Company.

The Track Supply Association has always been more than an organization of exhibitors. Its officers have co-operated in the work of planning the convention, arranging for hotel accommodations, inspection trips and the like. The need for this has become increasingly important as the two associations have attained proportions such that only a few hotels in the country are equipped to accommodate both the convention and the exhibit to the best advantage.



Officers and Directors of the Track Supply Association in 1916—Left to Right, J. J. Couzens, Director; W. C. Kidd, Secretary; F. A. Preston, President; R. A. Van Houton, Vice-President and Elmer T. Howson, Director.

Matter of Entertainment

Further than this those who were primarily responsible for the creation of the Track Supply Association were convinced that this new organization must serve as the instrumentality for the control of entertainment, through the replacement of individual activity with its abuses by co-operative measures. While there is no ground for the assumption that the entertainment incident to the Roadmasters conventions had given rise to abuses which transcended those common to other railway meetings of that period, there is evidence that there were conditions that warranted correction, It is significant that as early as 1891, a resolution was introduced by J. H. K. Burgwin (G. R. & I.) to the effect "that the Roadmasters Association of America will in the future decline to receive from any persons interested in selling track tools and appliances, any form of hospitality involving expense." According to the record, this gave rise to considerable discussion but failed to receive a majority vote.

Judging from such unpublished facts as have been obtained concerning the convention at Milwaukee in 1908, uncalled-for diversions during the time scheduled for the several sessions resulted in the regular attendance of only a small part of the limited number who had come to the meeting, and it is possible that the decision

*The business connection following each name is as of the time of holding office; a number of changes having occurred subsequently.

of the old Roadway and Track Supply Association not to participate at the convention had removed a restraining influence that was sorely needed.

With these unfortunate circumstances fresh in mind, the Track Supply Association established a policy with respect to entertainment that has had a profound influence on the conduct of the Roadmasters conventions. The plan by which this policy was put into practice is ingenious. Instead of attempting to evolve and enforce restrictive rules to curb entertainment by individuals, the association developed co-operative entertainment features designed to occupy the Tuesday and Wednesday evenings of the convention period and thereby reduce the available time for or need of any other entertainment. Out of this plan came the idea of the annual dinner which has been tendered to the roadmasters on the Wednesday evening of the convention week each year since 1912. This has always been an enjoyable affair and has been the means whereby many railway executives and men in public life have appeared before the roadmasters as speakers on vital subjects of the day.

Dinner Solves Problem

With the establishment of the annual dinner, the problem of Tuesday evening was disposed of by arrangements for semi-technical programs consisting in some years of illustrated lectures dealing with problems of track or track work from a more or less popular standpoint and in other years of industrial moving pictures illustrating the use of various commercial appliances in track maintenance.

From the beginning it has been the custom of the roadmasters to bring their wives and other members of their families to the convention, a thoroughly estimable practice but one which imposes the problem of entertainment for wives and friends during the hours that the convention is in session. Here again the Track Supply Association has met the situation, and it is of interest to note that in an account of the convention of 1904, held at St. Louis during the Louisiana Purchase Exhibition, reference was made to the fact that, "In accordance with a time-honored custom, Mr. William Goldie was delegated to escort the ladies to points of interest about the exposition."

For several years following the inauguration of the annual dinner, only the men in the convention party were invited to attend, the ladies being entertained at a theatre party. Later, however, invitations to the dinner were extended to all members of the roadmasters' families with results to the eminent satisfaction of those who had proposed this plan with no little misgiving. Similarly it was found that the Tuesday evening programs were apparently of almost as much interest to the women as to the men.

Policies Well Defined

In its relations with the Roadmasters' Association, the Track Supply Association has maintained an attitude of helpfulness while avoiding anything that savored of paternalism. Thus, when it was once proposed that the dues of the supply association be increased for the purpose of amplifying the funds in the Roadmasters' treasury, the idea was promptly voted down on the ground that the railway organization must stand on its own financial resources if it were to maintain its independence and be worthy of the respect of the supply men.

However, in all their co-operative relations, the manufacturers have kept clearly in mind that their primary objective is that of providing an exhibit of tools, appliances and materials of special application to track or to the conduct of track work. It may be said with equal force that the members of the Roadmasters association and other railway men who have attended the convention have been equally keen to recognize the exhibit as an important means of education. If this were not so and railway men were not given to a careful study of the products on display, the manufacturers would long since have abandoned the heavy expense of transportation, cartage, display space, etc., which is involved.

Exhibits Highly Practical

That the exhibitors have taken themselves seriously is evidenced by the showing of actual stock units of rail joints, switches, motor cars, fencing, machines, hand and power tools, etc., while models, photographs, catalogs and other forms of display have been confined, in the main, to equipment too large to be handled away from the track. In a word, the exhibition has come to be an object lesson in the practical application of the latest and best in track supplies.

No better evidence of the value of the exhibit can be offered than the regular practice of the Committee on Track and the Committee on Work Equipment of the A.R.E.A. to schedule meetings at the time and place of the Roadmasters' convention in order that the members of the committees may be afforded an opportunity to study the exhibit. It is significant also that railway executives who have been invited to address the roadmasters have almost invariably manifested their interest in the exhibit and have frequently stressed its value in their remarks. Furthermore they have encouraged visits to the exhibits by engineers, foremen and other officers of those roads not identified with the Roadmasters association.

The Track Supply Association is an organization of practical business men, yet in the promotion of many of the products on display at their exhibits they have had to have in their make-up enough of the idealist to visualize track and track work not as it is but as it ought to be. It has required courage to demonstrate a device that seemed at the moment so far in advance of the time that scarcely a man who saw it dared even to suggest its purchase to his management. But such courage has been rewarded, for like the motor car, many a device that when first exhibited was deemed only an ingenious but extravagant novelty is now accepted as a veritable necessity.

Another Function of Exhibit

Thus, the exhibits of the Track Supply Association have served each year not only as the agency for the most advantageous display of appliances and materials of established merit, but also as the means through which the products of inventive genius could be launched on a career of profitable use. But those who fostered this enterprise have had foresight enough to recognize that their task was by no means confined to measures designed to improve the physical character of these annual displays of their wares. They have realized that the greatest measure of success for the exhibits could be had only if the Roadmasters conventions were also a success, and they have bent their efforts to that end also. Those members of the Roadmasters who have had the most to do with its growth and increasing influence during the last 20 years, realize fully the part that the Track Supply Association has played, and are unsparing in their expressions of appreciation for the helpful co-operation they have enjoyed.

On the Illinois Division of the Rock Island

The Rock Island modifies its maintenance organization to provide more time for constructive work and to insure more thorough supervision

Bringing the Section Forces Up to Date

A COMPLETE reorganization of the maintenance of way forces and methods of supervision is in progress on the Chicago, Rock Island & Pacific. To date this reorganization has been affected on all of the main lines of the system north of Kansas City, except in the Chicago terminal, and on two divisions on the southern lines. Basically, the plan provides for longer track sections and for more regular and intensive supervision of the routine section work through the employment of track inspectors who also relieve the section forces of the necessity of patrolling the track except in emergencies.

On the Rock Island, as on other roads, the revolutionary changes which have taken place in recent years in track and roadway maintenance, and which are still in progress, have had a profound effect on the status of the section gang. The widespread use of motor cars, ditching machines, cranes and other power equipment; the adoption of heavier rail sections, of treated ties, of better and more ballast and of wider roadbed sections, as well as better drainage; the use of weed destroyers and numerous other methods for eliminating hand work, have resulted in stronger and stiffer track and a marked reduction in the amount of routine section work that must be performed by hand, so that the number of men required for this class of work has declined steadily.

These conditions pointed to the practicability of longer sections. On the other hand, it was foreseen that longer sections would tend to increase the amount of time for patrolling the track and for attending to the small items which always arise in connection with section work, thus reducing the relative amount of time that could be applied to the constructive features of track maintenance.

During the period that these changes have been taking place, and largely as a result of them, new demands have been made on the time of roadmasters, so that they have been unable to give the same attention to the details of section work which they were able to give formerly. They have also been unable to spend the time with individual gangs which is necessary if they are to obtain the maximum efficiency from these gangs. In other words, as methods, materials and equipment have improved, both the quality and the amount of supervision given to the primary unit of the maintenance organization have declined absolutely as well as relatively through no fault of the personnel.

In view of these facts, the maintenance officers of the Rock Island became convinced that both economy and efficiency could be increased by some modification of the existing organization of the maintenance forces. A study of the situation indicated that an organization which was based on the conditions when hand methods were employed exclusively did not have the needed flexibility to adjust itself to the changes which had taken place. This study also convinced them that for the present at least no satisfactory substitute for the section gang has been devised.

As a result of these studies it was decided not to depart, therefore, from the present form of organization, but to modify it in such a way as to correct its undesirable features. Two changes were made: Sections were combined to reduce the number and increase the mileage of the individual sections, and a new position, that of track inspector, was created. Experience thus far has indicated that the combined gangs are maintaining the track over the increased mileage in better condition than when the larger number of gangs was employed.

Prior to the reorganization, main-line sections averaged 6 to 7 miles on a single track and about 8 track miles on double track. Under the new arrangement they include from 9 to 12 track miles, depending on the

number of switches and the amount of track in sidings. The force on the individual sections varied from 1 to 6 men according to the season, and it is intended that the same force per mile of track shall be maintained on the extended sections except during winter months. No change was made or is in contemplation on branch lines since the present sections average from 12 to 14 miles of main track.

Section Forces Relieved of Track Patrol

Under the old system, the section foreman patrolled the track, sometimes alone on foot, but more frequently on the motor car with two or more of his men. In either event, this system reduced the productive time of the gang by a relatively large amount. In addition, many of the minor tasks, such as caring for switch lamps, replacing missing bolts and other odd jobs which must be given attention, still further reduced the time which could be applied effectively to the larger aspects of track maintenance.

To relieve the foreman of these small duties and to enable him to confine his efforts and those of his gang to the primary work of track and roadway maintenance a new position, that of track inspector, was authorized. Track inspectors perform many of these minor tasks and oversee the details of the section work.

Each inspector is given a light inspection car and is assigned a district which includes six section gangs. On single track this gives him from 60 to 70 miles of line which he is expected to go over in one direction every working day. On double track he has about 35 miles of line which he doubles over every day.

In addition to his principal duty of patrolling the track and inspecting all switches daily, he must examine all bridges and culverts at frequent intervals and report any defects in these structures to the roadmaster and master carpenter. He fills and cleans all switch lamps, applies missing bolts, paints switch targets and derails and looks after numerous other odds and ends to avoid the necessity of detailing a trackman to perform the work. The inspector reports to the roadmaster and delivers his instructions to the section foremen, acting in this respect as a liaison officer between the roadmaster and the foremen. He looks after the details of the section work, co-ordinating the work of the respective sections and sees that all necessary work is performed. To reduce the time lost on outlying sections by running to distant stations he makes deliveries of gasoline and lubricating oil for motor car use and delivers pay checks.

Formerly a roadmaster's territory averaged about 175 miles. Under the new arrangement these districts have been increased by decreasing by one the number of roadmasters on an operating division and dividing his territory among those remaining. On one division two roadmasters' districts were discontinued.

Roadmasters who were affected by these changes were appointed as track inspectors. The remaining positions of track inspector were filled by section foremen who were deemed to be best qualified for this service and, in several instances, by junior members of the engineering department who had had maintenance experience. After these selections had been made, the section foremen on each district were placed in the order of seniority and preference, the junior foremen being returned to the gangs where they are in line for promotion as vacancies occur.

This plan was first applied on the Colorado and Nebraska division, where it was made effective on August 16, 1931. From the start, the results were so satisfactory that since that date the reorganization has been completed progressively, a division at a time, until at present all of the Northern lines, comprising five divisions, are included, except the Chicago terminal. Likewise, the reorganization has been completed on two of the six divisions on Southern lines.

As an illustration of the results that have been obtained, the savings on the Colorado and Nebraska division during the first five months of 1932 were at the rate of $60,000 annually. This division comprises 750 miles of main lines on which 37 sections and 1 roadmaster's district were eliminated and 10 track inspectors were appointed. On the 7 divisions to which the reorganization was applied 176 sections were eliminated and 57 track inspectors were appointed. On these divisions the saving, based on a normal force of trackmen, is estimated to be $222,411 annually.

A canvas of the division officers indicates that, owing to the added time that is available for constructive work as a result of relieving the section forces of track patrol and of the necessity for attending to the minor work that has been mentioned, as well as because of the constant and more intensive supervision which the plan affords, they are unanimously of the opinion that the track is being maintained in better condition than under the old organization.

It is not the present intention to employ extra gangs for any of the routine work of maintenance such as putting in ties, surfacing, etc. The prevailing practice of providing extra gangs for intermittent work, such as laying rail, ballasting or surfacing new rail, will be followed, however, as it has been in the past.

Two Interesting and Unusual Bridges on the Chicago, Milwaukee, St. Paul & Pacific in Eastern Washington

Small Preframing Plant Effects Large Savings

New facilities of the Erie at Paterson, N. J., for gaining and boring bridge timbers before treatment are highly practical and efficient

Looking from the Framing Mill Over the Pre-Assembly of Two Sections of Deck for a Long Deck Girder Structure

THE preframing of bridge ties has always been the practice of the Erie since it standardized on creosoted timber for bridge decks in 1926, but it was not until 1931 that the road adopted mechanical methods for doing this work. Last spring the Erie constructed a modest, yet well arranged bridge timber framing plant at Paterson, N. J., designed essentially to handle the work for the Eastern district of the road, but which during the present year has also effected large economies in the preframing of bridge ties for the entire road, in addition to the preframing of a considerable amount of other timbers, including those for treated timber ballast deck and overhead highway bridges, freight platforms, piers, wooden trusses, etc. During the four months in 1931 that the plant was in operation, approximately 260,000 ft. b. m. of timber passed through it, while thus far this year it has preframed approximately 387,300 ft. b. m. As a result of this operation, it is estimated that the savings in the cost of machine framing alone, over framing by hand in the field have been over $6,000.

Relatively Small Layout Involved

The new plant, which cost only about $3,800, exclusive of grading the site, is located immediately alongside the creosoting plant of the Federal Creosoting Company, which treats bridge timbers for the road. This site was selected primarily because of its proximity to the treating plant, which saves at least one handling of the material over that which would be necessary if the preframing plant had been located farther away. This factor alone results in a saving of approximately $3 per M. ft. b. m., which on the basis of the timber handled through the plant thus far, has resulted in a saving of approximately $1,800. Although the framing plant is near the extreme eastern end of the road, it causes no inconvenience or additional expense by reason of this location since most of the bridge ties and timbers used come from the South in ships and are received at Weehawken, N. J., in the Port of New York.

The facilities at the plant include essentially a receiving and storage yard, a framing mill, and a pre-assembly area where complete decks are laid out just as they are to be installed in the field. Other facilities at the plant include a small frame office building, 10 ft. by 12 ft., alongside the framing mill, and a locker room building, 10 ft. by 15 ft., for the use of the carpenters at the plant, which is located at the far end of the pre-assembly area.

The framing mill is an inexpensive, one-story frame structure, 12 ft. wide by 36 ft. long, with a plank floor. To afford the best of daylighting to facilitate the framing operations, it is provided with full width hinged doors at both ends and with two wide sliding doors on its front side.

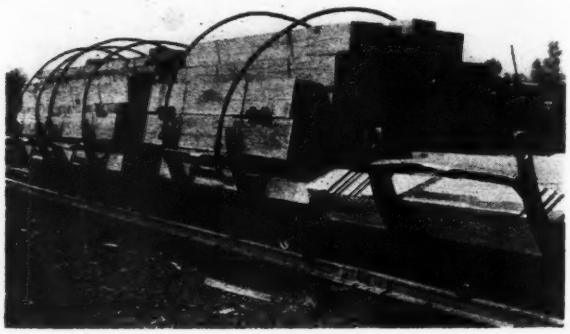
Within the mill building there are three main woodworking units: A 36-in. cut-off saw, driven by a 4-hp. motor; a dapping machine with a 16-in. blade, which is driven by a 4-hp. motor; and a general service woodworking machine, driven by a 5-hp. motor, which is adapted for a wide range of operations, including dapping, gaining, ripping, and for making bevel cuts. These machines are lined up in the order mentioned from the west end of the building to the east end, along the rear wall, with adequate space between them so that the operations at each will not interfere with those at the others. All three machines, which are DeWalt units, are served by a continuous roller table, 49 ft. long, which extends through the building, directly in front of them.

Straight Line Operation Provided

All timbers handled at the plant are received in cars loaded at the piers in Weehawken and are stored in an area immediately west of the framing mill, directly alongside a service track. Most of the timber received is air seasoned in the South before shipment north, so that there is no need for prolonged seasoning of it at the framing plant. However, all of the timber is piled carefully to permit the free circulation of air about it.

The timber is drawn from the storage yard as required and is moved on push cars to the west end of

the framing plant where, piece by piece, it is moved laterally over skids to a set of rollers in direct line with the roller table passing through the framing plant. In this position, the timbers are marked for all cuts to be made and are then pushed forward over the roller table, top up, to the cut-off saw where they are cut to length. A short movement from this position brings them in front of the dapping machine where daps of any depth, as indicated, can be made rapidly. Moved ahead over the table a distance of about 15 ft., the ties are in position before the woodworking machine where gains are made



Bridge Ties and Guard Timbers Pre-Framed and Loaded at the Plant for Direct Movement Into the Treating Cylinders

to accommodate rivet heads, if the ties are to be used on deck girder structures. With the last of these cuts made, the ties are rolled out into the pre-assembly area where they are lined up in exact accordance with their relative positions in the bridge.

All sawdust and small cuttings at the plant are bagged for use in firing up locomotives. Some consideration has been given to the advisability of installing a pneumatic dust collecting system in connection with a burner which would automatically dispose of the waste material more economically than is the practice at present.

The pre-assembly area is a section of level, well-drained ground, approximately 150 ft. long by 40 ft. wide, equipped with two sets of rail skids, or racks, these simulating the girders of a deck girder structure. Movement of the framed ties to the skids is over a series of removable roller frames, which can be readily blocked up to carry the ties as far out into the assembly area as desired. The pre-assembly of a deck structure is begun at the far end of the assembly area and, as the ties are pushed into place, sections of the roller frames are lowered and put out of use. Through this method of handling the ties, the assembly of a deck is rapid and requires little physical effort.

Pre-Assembly Insures Accurate Drilling

The work on the assembly skids in connection with the pre-framing of a deck consists essentially of making the splice cuts in the ends of the deck guard rails, and the boring of the holes for lagging the guard rails to the ties. No daps are made in the guard pieces, this practice having been abandoned a number of years ago with the adoption of a plain, 4-in. by 8-in. guard timber that is fastened to each tie by means of a ¾-in. by 11-in. lag screw and is framed only to provide splices at the ends. The boring of the guard pieces and ties is done during the pre-assembly work because of the greater accuracy insured as compared with attempting to mark and drill the pieces individually in the mill building.

One of the accompanying illustrations shows approximately 200 ft. of a single-track bridge deck lined up on the assembly skids, this being a part of an order passing through the plant for 940 ft. of deck for a long deck girder structure. This particular deck structure calls for a walkway along one side, which accounts for the long ties at regular intervals.

The same illustration also shows boring operations under way. These are done with two electric hand drills. In this work, a ¾-in. lag screw hole is made through the guard piece at each tie, and is extended 5½ in. into the tie as a ½-in. hole.

All cutting of guard timbers to length, as well as the scoring for splice cuts, is done with a Crowe electric hand saw with a 10-in. blade, while the splice cuts themselves are made with a hand adze. A minimum length of 12 ft. is specified for guard pieces, but these are usually furnished in 16-ft. lengths. All splices are made directly over ties.

Pieces Carefully Marked for Identification

For the purpose of identification in the field and for convenience in shipping and erection, each deck timber is marked with stamping dies, the tie marks being made in the ends of the ties, and the guard rail marks on the top side of the pieces at the center and at the ends. The marking usually covers three items. The first embraces two or more letters indicating the division, as N Y D for the New York Division, M D for the Marion Division, etc. The second item is the bridge number, and the third includes symbols showing the location of

View Through the Framing Mill Showing a Bridge Tie Being Cut to Length by the 36-In. Cut-Off Saw

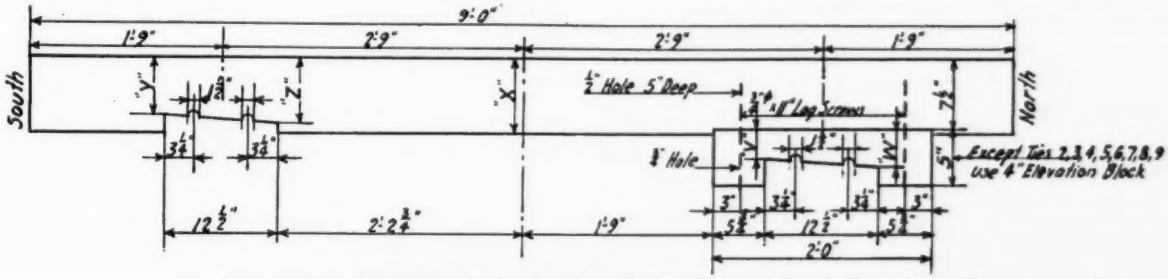
the piece in the deck. In the case of ties, the position markings include the number of the tie from the east end of the bridge, followed by the letters "EB" or "WB" to indicate whether it is to be placed in the eastbound or the westbound track, if a double-track structure, and the further letters "N" or "S" (north or south) to insure that some of the ties will not be turned end for end. All of these identifying symbols are placed on one end of the tie, while the other end bears only the marks "N" or "S".

Guard rail pieces are marked on top at the center to indicate the division, bridge number, whether for the north or south side of the bridge, and the number of the piece from east to west. At both ends they are marked only to indicate the piece number and whether for

the north or south side of the track.

All of the work at the plant is carried out by a force of five carpenters and a carpenter foreman, working eight hours a day for the number of days each week and months per year necessary to meet the demands on the plant. This force forms a smooth-working organization.

Following the framing and pre-assembly work, the work of the framing plant is complete. The forces of the creosoting plank break up the assembly and load the pieces directly on to narrow-gage creosoting cars on an adjacent track for direct movement into the treating cylinders. Through this arrangement, one full handling of the timbers is avoided by the railroad forces, without additional labor or inconvenience to the treating plant.



Section from a Plan Furnished to the Framing Plant, Showing Framing Details in Connection with Certain Specifc Ties for a Deck Involving Superelevation

The treatment given the ties and guard pieces, which are now generally of long-leaf yellow pile, is the Lowry, empty-cell process, employing a 60-40 creosote—coal tar solution; with a retention in the timber of 10 lb. per cu. ft. Following treatment the timbers are loaded into cars by the treating plant forces and are shipped to the bridge forces of the different divisions for installation.

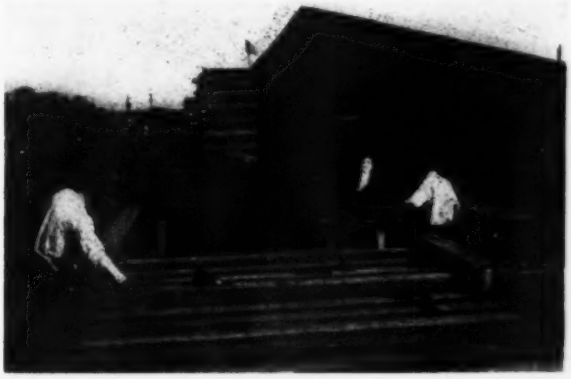
Preframing Proves Highly Practical

The first proposals to preframing bridge and trestle deck timbers were met with skepticism in some quarters, the practice being considered impractical and conducive to many serious errors. Experience in this work has made it evident that there are many chances for error, especially in connection with structures involving superelevation where careful and detailed measurements must be made, but, on the other hand, it has demonstrated that preframing is entirely practical and can be done without error. The work on the Erie has been most successful, errors of any kind being rare, and then usually insignificant in character.

All measurements for the preframing operations are made by the engineering corps of the division engineers, using levels and other precision instruments where necessary, and these are incorporated in detailed plans furnished to the framing plant for guidance in its work, and for use later to simplify field erection. In many cases these plans are relatively simple, and especially so in connection with short deck girder bridges with uniform cover plate thickness, and through girder bridges, in which cases the dapping is usually to uniform depth. In other cases the plans are quite complicated, especially when they call for the dapping and gaining of ties and elevation blocks demanded by superelevation on curves, and when allowance must be made for camber in spans. The only effect of the more complicated plans on the plant, however, is to slow up its output commensurate with the increased amount of work that must be done on the timbers.

The advantages of preframing as demonstrated on the Erie at its Paterson plant are many, these including increased life of the timbers through the prevention of damage by cutting into the treated wood; increased speed of erection in the field; less interference with train movements; better workmanship and, therefore, smoother bridge decks; savings in material purchases and less waste through making it possible to purchase to size and to utilize pieces requiring minimum cutting; and large savings in the cost of doing the necessary framing work over hand methods in the field.

The cost of framing bridge ties and guard rails at the plant, including all charges, both operating and fixed, has averaged approximately $8.75 per M. ft. b. m. as compared with an average cost of approximately $20 per M. ft. b. m. when done by hand, and more or less similar savings are being effected in the framing of other timbers at the plant. Based on expenditures incurred in handling 260,000 ft. b. m. of timber through the plant during four months in 1931 and 387,300 ft. b. m. up to August 31 this year, the savings effected through the preframing at the plant thus far, in comparison with hand framing in the field, have been well over $6,000, or more than $2,000 above the initial cost of the plant.



The Framing Mill, Showing Deck Assembly Work in the Foreground and the Timber Storage Area in the Background

The framing plant was constructed under the general direction of J. C. Patterson, chief engineer maintenance of way, and under the direct supervision of F. S. Wheeler, division engineer, and is being operated under the direction of I. H. Schram, engineer maintenance of way, Eastern district of the Erie, and Mr. Wheeler.

LOSS AND DAMAGE—Loss and damage paid by Class I railroads of the United States during the first six months of 1932 totaled $10,310,724, which represented a reduction of $3,846,002, or 27.2 per cent, as compared with the same period of 1931.

Does Ballast Effect Rail Breakage?*

By C. B. BRONSON
Assistant Inspecting Engineer, New York Central Lines, New York

THE question, "What effect, if any, does the character of ballast have on rail breakage?" is one regarding which maintenance men must hold an almost infinite number of divergent opinions and views. At the outset I feel justified in making the broad and somewhat bold assertion that no definite relationship can be found to exist between rail failures and ballast conditions, except in certain special cases, at least insofar as such relationship has been brought to light by the experience of the New York Central.

As is well known, our principal main-line mileage is ballasted almost entirely with stone, except for a limited amount of a good grade of washed gravel which is rapidly being replaced with stone. The stone ballast is of varying depth, governed largely by traffic requirements, the length of time the track has been ballasted with stone and by the roadbed and sub-soil conditions.

The vast majority of rail failures of all types on the New York Central occur on tracks that are ballasted with stone. Failures on branch lines where, for economic reasons, the ballast is of an inferior type, are of infrequent occurrence. In fact, on some branch lines, years elapse without any of the common types of rail failures occurring and on certain branches fissures are unknown. The first conclusion to be derived from these facts is that train speed and tonnage and the density of traffic are the factors that exercise the most influence on rail failures, pushing the question of ballast conditions into the background.

Influence of Fouled Ballast

Another angle to the situation is presented by the fact that on our stone-ballasted track the ballast becomes fouled with cinders and with the leakage of materials from cars of coal, ore, etc. Although in normal times we employ "moles" for cleaning the ballast in many places, fouling occurs so rapidly in some territories that it is difficult to keep pace with the necessity for cleaning it. In some cases the foreign material may amount to as much as 40 per cent by volume of the ballast section. In spite of this situation, however, the number of rail failures in track of this character has not shown a definite increase.

I do not, of course, mean to imply from these arguments that low grade or fouled ballast is desirable, for, to the contrary, we are all striving for the betterment of ballast conditions. We also know that adequate roadbed drainage makes smoother riding track and reduces the frequency with which the track must be lined and surfaced. The fact remains, however, that inferior ballast in the lighter traffic lines or fouled ballast in territory of denser traffic have not had any noticeable effect on rail failures.

The real advantage then of the use of ballast of a superior quality is that it increases the stiffness and ruggedness, or modulus, of the track, which is a prime factor in increasing its apparent carrying capacity, in maintaining a more uniform standard of maintenance and in tending to reduce the frequency of resurfacing. In my judgment, these, rather than the question of rail failures, are the paramount considerations involving the quality of ballast to be used.

In considering the various types of rail failures as they may be influenced by the quality of the ballast, we can almost eliminate half moon or base breaks and split webs from consideration as, in comparison with the days when Bessemer rails were the predominating type, they have almost ceased to occur. Moreover, with the almost universal adoption of the three-tie-supported joints with the six-hole splice bar, bolt-hole breaks have likewise become infrequent. We had an excellent illustration of this on one of our lines of heaviest traffic where bolt-hole breaks numbered as high as 1,000 to 1,200 per year with the hit-and-miss system of joint support using four-hole angle bars but on which, since adopting the six-hole bar and three-tie joint as standard, we have had only three rail failures due to bolt-hole breakage in more than 10 years.

Effect on Bolt-Hole Breaks

Ballast conditions at or near the joints have a marked influence on bolt-hole failures, as well as on batter and chipping of the rail ends. The tendency to such trouble is therefore less in roadbeds of the proper rigidity and where proper consideration has been given to the spacing of the joint ties and the choice of splice bars. If this is not the case, the movement of the splice bars and the resulting wear of the fishing surfaces of the rail eventually cause looseness in the joint and the pumping of the ties that follows causes a muddy condition to develop in the vicinity of the joint and accelerates batter of the rail ends. This tendency can be offset effectively by applying reformed bars or their equivalent in which the fishing height has been increased somewhat.

Head failures of the crushed or split type are associated more directly with the quality, soundness and general condition of the metal in the head of the rail than with any other factor. In general, therefore, no direct connection can be established between head failures and the various types of ballast. In this connection, however, an advantage may be gained by restricting the use of "A" rails, which are the worst offenders for head failures, to tangent track and by avoiding their installation at locations where the ballast and subsoil conditions require frequent attention to maintain line and surface.

Transverse Fissures

Interior transverse fissures, in common with other types of failures, occur mostly on lines having the greatest traffic density and only infrequently on lines of lighter traffic, and the question of ballast seems to play a very small part in their development. Proportionately more fissures develop in some of our higher grade tracks than in those of a somewhat lower standard, and here again the records point strongly to the influence of the quality of the metal in the rail head as being the governing factor.

However, we have encountered some interesting exceptions where the number of fissures has varied considerably with the type of track and in one instance with a change in the type of ballast. In the latter instance, the track was ballasted with gravel and up to the time it was given a 10-in. lift on stone no fissures had developed. Within a few months after the lift, however, more than a dozen rails broke. Apparently, the impact effect of loads on the rail was increased by the stiffening of the track due to the application of the stone ballast

*This discussion was submitted for publication in the What's the Answer department, but because of its scope it is presented here as an independent article. See page 629 for further discussion of this subject.

and the effect of tamping, causing the rapid growth of what were undoubtedly small fissures that were in existence in the rail prior to the time the lift was made.

Varying circumstances have accompanied the development of fissures in rails on the New York Central, none of which seem to indicate that the quality of ballast is involved in any way. In one instance, an excessive number of fissures developed in about three miles of well-ballasted track, and, after all the rails were changed out and replaced with rails rolled by the same company, no further trouble of this nature was experienced. Since no change was made in the character of either the ballast or the roadbed when the rail was changed out, the circumstances certainly point to the fact that the development of the fissures was influenced more largely by the quality of the metal in the rail than by the condition of the ballast.

In still other cases the service records of certain stretches of track showed that no fissures had come to light but when the rail was changed out fissures subsequently developed ,even though the roadbed structure had not been changed materially except for a slight lift. On another occasion several fissures developed in the rail on a water pan but when this rail was changed out no further trouble of this nature was experienced.

In the light of the foregoing facts, I feel justified in reiterating the opinion that ballast conditions have not furnished the clue to rail failures with the few exceptions noted. It is, of course, understood that we are endeavoring to improve ballast conditions in order to attain the highest possible standard of maintenance.

Cleaning Pipe Lines with Acid

By R. E. COUGHLAN

Supervisor of Water Supply, Chicago & North Western, Chicago

DURING the past three years the Chicago & North Western has attained considerable success and effected measurable savings by the use of muriatic acid to remove the incrustation from the inside of water pipes of various sizes and lengths as well as from well screens. This method was adopted after rather extensive laboratory investigation for the purpose of determining the most suitable inhibitor that could be introduced to prevent corrosion of the pipe line as well as the pump, pipes and fittings employed in circulating the acid through the line, as success in this phase of the problem was necessarily an essential to success in the use of the acid process.

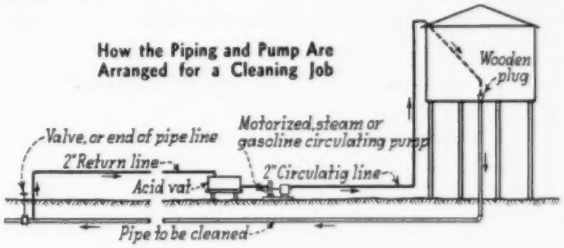
As a result of the tests made, it was found that the most suitable and economical material for this purpose is a blended tannin compound, known as Chesco extract, containing 25 per cent available tannic acid. Practical application has shown that the most satisfactory proportions are:

Muriatic acid (commercial 50 per cent hydrochloric acid)	50 per cent
Chesco extract	5 " "
Water	45 " "

This mixture has proved very effective in removing the incrustants from the pipes with a low corrosive action on the metal.

When a pipe line is to be cleaned by this method, a wooden vat, constructed of second-hand bridge timbers or similar material and having a minimum capacity of 1,000 gal., is set up usually at one end of the pipe line. A 2-in. discharge line connected to a circulating pump is installed between the bottom of the vat and the near end of the pipe, and a 2-in. return line is installed between the opposite end of the pipe and the vat. The line to be cleaned is drained and taken out of service so that there will be no possibility of contaminating water that is to be used for drinking or stock watering purposes. The required amount of the cleaning mixture is then placed in the vat and circulated through the system until all incrustation has been removed. The acid has no effect on the 2-in. piping. After the pipe has been cleaned it is flushed with clear water until all traces of the acid have been eliminated.

How the Piping and Pump Are Arranged for a Cleaning Job



In the chemical reaction that takes place, the hydrochloric acid in the mixture reacts with the incrustating compounds, which are usually carbonates of calcium and magnesium, to form the chlorides of calcium and magnesium and carbon dioxide gas. When the acid becomes exhausted by the process, which is approximately every six hours, it is replaced with a fresh supply, this being repeated until the pipe line is cleaned thoroughly.

Methyl orange may be used as an indicator to determine when the mixture has lost its effectiveness, but we have found it sufficient to observe the amount of carbon dioxide in the mixture, the absence of bubbles of this gas in the liquid discharged from the return line indicating that the hydrochloric acid has been consumed and is no longer effective. If possible, inspection holes are tapped into the line at various points in order to observe the progress of the operation. The worst cases of incrustation encountered, in which the capacity of the pipes was reduced approximately 72 per cent, have been cleaned in 36 hr. of continuous circulation of the acid mixture.

We have found that the best method for determining the amount of acid required for cleaning any particular pipe line is to use an amount equal to the cubical capacity of the line when free of encrustation. This acid is then diluted according to the formula given above.

Effect Decided Saving

During the last three years, pipe lines ranging from 4 in. to 12 in. in diameter and from 170 ft. to 6,500 ft. in length have been cleaned by this method at a cost of from 10 cents to 50 cents per foot, depending on the size and length of the line as well as the quantity of acid consumed. Because of the fact that the initial cost of setting up the apparatus is fairly constant, regardless of the length of pipe to be cleaned, it is apparent that the cost per foot of cleaning pipe lines is less for long lines than for short ones.

In several cases incrusted well screens have been cleaned successfully with full-strength commercial muriatic acid. In this process the acid is brought into direct contact with the coated screen by means of a 2-in. line installed inside the well casing. The acid is allowed to remain in contact with the screen for from 3 to 6 hr., after which the well is pumped until it is free of acid. If necessary treatment is repeated until the screen is clean.

What's the Answer?

Have you a question you would like to have someone answer?

Can you answer any of the questions listed in the box?

To Be Answered In December

1. Under what circumstances, if any, is it permissible to place track jacks inside of the rail? If permissible, what precautions should be taken?

2. How should the minimum distance between individual deep wells of a group be determined? What factors establish this minimum?

3. Are there any advantages in butt welding rails on steel bridges to eliminate the joints on the structures? Any disadvantages? What is the limiting length of span on which it should be done? Can continuous rails be carried across successive spans?

4. What is the best method of removing dirt and scale from steel bridges and other steel structures that are to be painted?

5. Is it possible to tamp ties too solidly? If so, what effect does this have on the riding qualities of the track?

6. What facilities should be provided and what methods employed for storing a winter's supply of locomotive sand?

7. In programming work, to what extent should section foremen be encouraged to plan their own work?

8. What methods can be employed to anchor precast concrete deck slabs to a steel structure to prevent their longitudinal and transverse movement?

Track Bolts

Can track bolts be kept too tight? If so, what effect does this have on track maintenance ?

Finds Bolt Tension Quite a Problem

By J. J. HESS

General Roadmaster, Great Northern, Seattle, Wash.

Is is quite a problem to keep track bolts adjusted so that the rails can expand and contract properly with temperature changes. Improper bolt tension may cause the rail to buckle during warm weather, or to contract in cold weather to such an extent as to leave too much space between the rail ends. Where bolts have been kept too tight, the application of oil to the angle bars is beneficial and frequently it is necessary to strike the angle bars with a maul in order to loosen them, even after the bolts have been loosened. When tightening track bolts, I have found it good practice to leave a reserve of compression in the nut locks for utilization later when it becomes necessary to tighten the bolts again.

Attributes Many Track Ills to Tight Bolts

By C. H. R. HOWE

Cost Engineer, Chesapeake & Ohio, Richmond, Va.

Track bolts are ordinarily manufactured from steel that has a permissible stress in tension of 24,000 lb. per sq. in. The allowable stress then of a 1-in. bolt, which has a sectional area slightly greater than ¾ sq. in., is 18,000 lb. which could be applied easily by the average trackman with a 36-in. wrench. Further, certain power wrenches now in service have sufficient capacity to twist bolts off if the release is not set properly. It is apparent, when other factors affecting the bolts' service are examined, that any track bolt that is overstressed by wrenching is too tight.

While it is true that the maximum intensity of the stress applied exists only at the time of tightening and decreases thereafter, there is little doubt but that fatigue and wear of the metal are accelerated and that the life of the bolt is shortened. Moreover, the excessive strain on the threads tends to distort them and renders the bolt unfit for relay service. Overtight bolts will cause rail to creep and thus entail additional expense in the purchase of rail anchors, or for labor in surfacing and respacing ties. The proper adjustment of bolt and spring-washer tension will permit temperature expansion and contraction of the rail to take place in a natural manner, if anchors are applied in sufficient quantity.

Little data are available on the exact effect of the added stress produced in track bolts by the impact of passing wheels but the results of tests conducted on the Pennsylvania (see A.R.E.A. Proceedings, Volume 31, page 1556) indicate that the stresses set up in track bolts by this agency are of a vibratory nature, the increase or decrease in the stress of the track bolt ranging from 25 to 100 per cent of the initial tension applied by the wrench.

The above objections to overtight bolts hold true regardless of whether or not spring washers are used. The degree of rigidity of joints equipped with spring washers of any kind increases rapidly after a tension of 20,000 lb. is reached. At this point the so-called deformed washers have reached their free bending limit and between 20,000 lb. and 30,000 lb. only a minute deflection takes place. Overstressing bolts not only has a tendency to elongate them but also distorts the washers, thereby shortening their service life and rendering them unfit for reuse.

Bolts Can Be Kept Too Tight

By R. L. HAMILTON
Section Foreman, Seaboard Air Line, Sandy River, S. C.

As a result of my experience, I am decidedly opposed to keeping track bolts too tight, especially in warm weather. If this is done, end expansion of the rails is prevented and there is danger that sun kinks may be formed in which the track bends or buckles either out of line or out of surface. Such kinks are dangerous and may result in serious accidents. In some cases where the bolts are too tight it may be necessary to loosen them and apply oil to the joints in order to allow the rails to return to their normal position.

Storm Windows

Is it economical to apply storm windows to small stations in northern latitudes? If so, how should this be done and how should they be applied and stored during the summer ?

Save Fuel and Increase Comfort

By ANDREW FINNES
Master Carpenter, Great Northern, Minot, N. D.

In northern latitudes where the temperature ranges between 5 deg. and 35 deg. below zero during the winter, it is economical to apply storm windows on small station buildings for the reason that they result in a saving in fuel and make the interior of the building more comfortable. The latter point applies particularly in the case of the operator, who normally works close to a window, the most uncomfortable place in the building if no protection is provided.

When storm windows are first received, they should be properly fitted by a carpenter from a nearby bridge crew so that they can be readily applied and removed by the station agent or section men. During the summer, the storm windows should be stored overhead on the ceiling joists of the freight room where they will not interfere with routine operations.

Not Only Economical But Necessary

By J. W. ORROCK
Engineer of Buildings, Canadian Pacific, Montreal, Que.

With my experience with this problem in Canada as the basis of my opinion, I find that storm windows or winter sash for small stations are not only economical but necessary. Many of these stations are heated with stoves and the winter sash serves to seal the openings and prevent air leakage between the sash and frames. The air leakage is particularly noticeable during storms or when high winds prevail and it is our belief that the use of double sash results in a considerable saving in fuel and adds to the general comfort of the building interior by eliminating drafts.

In most buildings it is customary to apply the winter sash on the outside, covering the entire opening with one sash where possible, attaching it to the window frame with bolts, or hooks and eyes on the inside. Each sash is provided with a small slot and flap in the bottom rail for ventilating purposes on mild days. On other types of buildings the winter sash is applied on the inside, usually in the form of a fixed transom with two side-hung leaves for the lower section.

As most small stations have freight sheds adjoining them or located nearby, the winter sash can be conveniently stored in the freight shed during the summer. If the station has a basement, the sash may be stored there on racks provided for the purpose.

No Question as to Economies

By E. C. NEVILLE
Bridge and Building Master, Canadian National, Toronto, Ont.

Economy is too often measured by the visible savings in initial expenditures, instead of by the savings resulting from expenditures that are spread over a number of years. In my opinion, there is no question as to the economies effected through the application of storm windows to small stations in northern latitudes, of which one of the most important is the conservation of fuel. A saving of from 10 to 20 per cent in the cost of fuel is not unusual, especially where the building is in a fair state of repair and where the space beneath the floor is properly enclosed.

The use of storm sash also reduces the fire hazard, as it is not uncommon in buildings that are not equipped with storm sash to see the stove and pipe heated to a cherry red in an effort to make the room comfortable. Greater efficiency on the part of employees and the increased comfort of patrons are other benefits resulting from the use of storm sash.

Storm sash should be made to fit properly and should be installed with simple fastenings in order that they may be easily removed or installed by the agent or section men. Care should be taken to mark all sash so that no difficulty will be experienced in the fall in matching each with the window frame for which it was fitted when originally installed.

Ballast and Rail Breakage

What effect, if any, does the character of ballast have on rail breakage ?

[A comprehensive answer to this question by C. B. Bronson is presented elsewhere in this issue under the title Does Ballast Effect Rail Breakage?—Editor]

Ballast May Be in Part Responsible

By C. W. BALDRIDGE
Assistant Engineer, Atchison, Topeka & Santa Fe, Chicago

The breakage of rails is due to so many causes and occurs under so many different conditions that it is difficult to determine how much influence the character of the ballast has on rail failures. Broken rails may occur less frequently in track with a poor quality of ballast that is well maintained than in track on a good quality of ballast that is poorly maintained. It has been my experience, however, that rail failures in the form of bolt hole breaks occur much more frequently in "shell" ballast than in gravel ballast and more frequently in the latter type of ballast than in ballast of crushed rock or other hard material.

Shell ballast consists of marine shells that are dredged from the Gulf of Mexico or perhaps other waters, or that are taken from shell banks along the coast, and, in addition, contains some gravel or sand. The shells tend to produce a soft spongy ballast that allows the joints to yield more under load than do the other types of ballast, thereby causing more frequent splitting of the web of the rail through the bolt holes. Gravel ballast

seems to produce similar conditions although bolt hole breaks do not occur as frequently in this ballast as in shell ballast.

Except in the case of bolt-hole breaks, the writer has never noticed any difference in the number of rail breaks that could be ascribed to the character of the ballast, exclusive, of course, of the standard of track maintenance prevailing.

Plays Important Part in Rail Breakage

By ROY HAHN

Clerk to Master Carpenter, Seaboard Air Line, Tampa, Fla.

The character of the ballast that is in use has a considerable influence on the number of rail breaks that occur. For this reason the selection of the type of ballast to be used must be given careful consideration in order to obtain a material that will not crush under heavy loads, that will resist the deteriorating effect of changing weather conditions and that will be hard enough to resist the action of tie tampers and picks.

If the ballast does not measure up to these requirements, the chances are that considerable trouble will be experienced because of rail breakage owing to the fact that a poor grade of ballast will deteriorate rapidly, resulting eventually in a rough condition of the track which is largely responsible for rail breakage.

Discharge Lines

Is it practicable to connect a deep-well pump to a discharge line? Why? If so, under what conditions is it permissible to do so ?

Is Practicable in Most Cases

By J. B. WESLEY

Engineer Water Service, Missouri Pacific, St. Louis, Mo.

Any discussion of this subject hinges on the interpretation that is placed on the first part of the question. I assume that it refers to a discharge line that delivers the water against service-line pressure or to a place of storage at a greater elevation than the pump. With this understanding of the question, in my opinion, such connections are practicable in most cases and only some unusual condition may make them undesirable.

In any pumping installation the facilities and connections should be so chosen as best to meet local conditions. If an air lift is used, there may not be sufficient air pressure available to permit discharging directly into the service system, or it may not be possible to secure sufficient submergence of the pump. If the well is delivering appreciable amounts of sand or gravel, it is not desirable to pump directly into the discharge line because of the possibility of causing the gradual clogging of the pipe. Moreover, water sometimes contains gases that are injurious to pipe, and such water should not be discharged into the line without first permitting the gases to escape into the atmosphere.

Where such conditions do not exist, as is the case at most installations, the direct connection of the pump to the discharge line is desirable. This permits operating the entire plant with one power unit and one pumping unit, thus providing maximum simplicity of installation and operation. Further, if the pump used is designed properly to meet local operating conditions, greater operating efficiency will be secured and maintenance costs will be less than if double pumping is used.

Railroads Favor Direct Connection

By A. E. WILLAHAN

Assistant Engineer, Kansas City Southern, Kansas City, Mo.

Probably the majority of deep-well pumps now employed in water supply service on railroads are connected directly to the supply lines of elevated storage tanks. This practice eliminates the second pumping plant with the attendant operation and maintenance costs.

The conditions under which the practice should be followed are readily determined. The first requisite is that the head against which the water must be pumped above the ground line must be comparatively low, preferably 30 or 40 ft. since deep-well pumps, as commonly designed, are not as efficient for high lifts as the surface pumps that are now available. In deciding when and where to use the second pump, the availability and cost of power must be considered and the cost of pumping water per 1,000 gal. with a single unit and with a combination of two units must be determined for purposes of comparison. A discharge line that is connected directly to a deep-well pumping head should be as free from bends as possible and a suitable check valve should be installed near the pump.

Considers Both Discharge and Service Lines

By J. H. DAVIDSON

Water Engineer, Missouri-Kansas-Texas, Parsons, Kan.

In discussing this question it is important to keep in mind the distinction between a discharge line and a service line. As defined by the Water Service committee of the A.R.E.A., a discharge line is "a line of pipe through which the water is forced by the action of the pump" and a service line is "a line of pipe through which water is distributed to points of actual use, as distinguished from suction lines and discharge lines to tanks or reservoirs."

The three types of deep well pumping equipment in common use are reciprocating pumps, turbine pumps and air lifts. Accepting the above definition of a discharge line, we find that all three of these types can be connected directly to a discharge line. In the case of reciprocating pumps and turbine pumps, the discharge line can consist of horizontal or vertical lines of pipe or a combination of the two, the limiting factor in the length of the pipe line and the height to which the water can be lifted being the total operating head on the pump, which of course, must not exceed the operating range of the equipment.

In the case of the air lift, the water can be carried vertically in the discharge line to an elevated tank, provided the well is deep enough and the pumping level of the water is such that a constant submergence of the foot piece, equal to twice the distance the water is to be raised, can be secured. In connection with the air lift, a "booster", which makes use of the air liberated from the water on reaching the surface of the ground, can be used to force the water through horizontal runs of pipe and to moderate elevations. However, if the water is to be forced against any considerable pressure, it is usually more economical to install a sump or reservoir at the ground level to receive the water and use a more efficient type of pump, such as a centrifugal, to force the water through the discharge or service mains, since the "booster" creates a back pressure against the discharge of the water from the well.

Both the turbine and reciprocating types of deep-well pumps can be connected directly to service lines as defined above, provided that the total operating head does not exceed that for which the pumping equipment is

designed. When driven by steam or electric power, reciprocating and turbine deep-well pumps may be arranged to pump directly into elevated tanks, reservoirs or service lines with full automatic control. When pumping directly into elevated tanks or against service-line pressure, the pumps should be fitted with suitable air chambers and check valves in the discharge line, and in most cases it is desirable to install a pressure relief valve.

In most cases where moderate operating heads are encountered in deep-well pumping, it will be found economical to connect the deep-well pump, if of the turbine or reciprocating type, directly to the discharge or service line. Where extremely high discharge heads are encountered, it may be more economical to have the deep-well pump discharge at the surface and make use of an additional pump of suitable design to force the water through the service line.

Tie Tamper Outfits

How many men are required for the most efficient results with a surfacing gang, spacing and making a light renewal of ties, with a 4-tool tie-tamper outfit? With an 8-tool outfit? With a 12-tool outfit? Does the kind of ballast make any difference? How should the men be placed ?

Two Organizations for 4-Tool Outfit

By A. A. MILLER

Engineer Maintenance of Way, Missouri Pacific, St. Louis, Mo.

Any organization that may be set up for this type of work will naturally vary to some extent with the raise, the number of ties to be renewed and other variable factors. However, one type of organization, designed for a four-tool tie-tamper outfit, that I have found to give good results consists of 15 men, exclusive of the foreman, and is divided into three groups. The foremost group, or Group 1, comprises 6 men with jacks giving the track the necessary raise and tamping the joint, center and quarter ties. Group 2, consisting of 4 men, spaces and inserts ties and prepares the ballast for tamping, while Group 3, also containing 4 men, follows with the tie tampers. The remaining man handles the tie-tamper cables and does other incidental work.

When Group 1 has gained a sufficient lead over the remainder of the gang, it drops back and replaces Group 2, which in turn moves to the rear of Group 3 to fill in ballast, tighten bolts, etc. This operation is repeated until the remaining time is sufficient only to line the track, dress the ballast and distribute material for the following day. In this latter work, Groups 1 and 3 line track while Group 2 distributes material and picks up surplus material and scrap. In the last operation, all three groups join in giving the day's work a final dressing. Two men should be added to this organization when it becomes necessary to use flagmen, when the raise is more than two inches, or when the tie renewals are very heavy.

Another type of organization, requiring 17 men and a foreman, gives equally good results as those described above and the amount of work done per man per day is about the same. Where the track raise is 2 in. on gravel, small slag or cinder ballast and the ties are being spaced and renewed at the rate of 6 for each 39-ft. rail, the organization and order of work for such a gang is as follows: Two men with four small track jacks, two on each side, who also assist in the spacing of ties; one man using the level board, marking centers on the rail for tie spacing and pulling spikes from ties that are to be removed; two men renewing ties; three men driving spikes and gaging the track; four men with the tampers tamping each tie completely as they progress; two men assisting with the tampers, filling in ballast, etc.; and three men dressing the track behind the tampers, tightening bolts and adjusting rail anchors.

The two foremost men should keep the rear jack on each side raised to grade for tamping, while the forward jacks should be raised to within one inch of grade in order to provide a run-off to prevent the humping of the track. The foreman handles the spot board for raising the track and also attends to the tie-tamper power plant. The lining of the track and the piling of released ties should be done near the close of the day's work.

Governed by Local Conditions

By G. W. MORROW

Ingersoll-Rand, Inc., Chicago

Many practical maintenance men will not agree that it is good practice to make tie renewals while surfacing track, owing to the fact that the tie plates settle into the new wood and cause loose ties within a short time, and to the further fact that the tie-renewal work delays the surfacing gang. While ties can be renewed at a lower cost when the track is jacked up for a raise, the saving is offset by heavier maintenance charges later. Where a heavy ballasting job is involved, it is better to change out the ties while the track is being given a general overhauling, but in ordinary surfacing operations the desirability of this practice is questionable for the reasons noted above.

The number of men required for the surfacing operation depends to a considerable extent on the type of ballast that is encountered. Light ballast facilitates the work and allows men to be released for other operations, while stone or gravel ballast, containing 2½-in. to 3-in. sizes, retards the tamping on resurfacing work where the average raise is 1¾ in. Other factors that have a bearing on the number of men required for the various operations are the amount and kind of ballast already on the ground, the weight and condition of the rail, the amount of traffic and the number of tracks.

The following tentative organzations for three gangs equipped with 4-tool, 8-tool and 12-tool tie-tamper outfits, respectively, are based on a light renewal of ties, an average raise of 1¾ in., stone ballast, and either single or double track.

Four-Tool Outfit

Number of Men	Operation
1 foreman	
1	Digs jack holes, taps down spikes, removes spot board on approach of trains and assists in other operations occasionally.
2 with 4 jacks	Move one pair of jacks when tampers approach, space ties, assist in removing old ties, handle the short level board and middle sighting bob.
2	Insert new ties and throw in new ballast; also assist in spacing ties occasionally.
4	Throw in ballast, dress track, assist with tampers and change connections.
4	Operate tie tampers.
1	Carries water and is available for odd jobs.

Eight-Tool Outfit

Number of Men	Operation
1 foreman	
1 assistant foreman	Sighting.
1	Digs jack holes, taps down spikes and handles spot board.

2 with 6 jacks	Move up jacks as tampers approach, space ties if necessary and handle the short level and sighting bob.
2	Renew ties, assist jack men to space old ties and throw in ballast.
1	Assists jack gang and tie gang and straightens rail anchors.
6	Throw in ballast, move pipe line and connections and dress track.
8	Operate tie tampers.
1	Attends to compressor and pipe lines and odd jobs.
1	Carries water and is available for odd jobs.

Twelve-Tool Outfit

Number of Men	Operation
1 foreman	
1 assistant foreman	Sighting.
1	Digs jack holes and handles sighting board.
2 with 6 jacks	Each handles three jacks on each side; also spaces ties.
2	Renew ties, assist jack men in spacing old ties and throw in ballast.
2	Tap down spikes, adjust anchors, handle short level board and sighting bob, and assist generally ahead of tampers.
8	Throw in ballast, move pipe line and connections; available for building crib ahead for compressor, for lining track behind and for alternating with men on tampers.
12	Operate tie tampers.
1	Carries water.
1	Attends to compressor and pipe lines and does odd jobs.
1	Watchman.

In some cases local conditions may dictate slight alterations in these organizations. If the rail surfaces well without "back-tracking", the gangs should move ahead without delay. The organizations are based on the assumption that all ties are tamped with tie tampers, the rail being held up by the jacks until the tampers approach. This is safer than "tacking up" the track, which requires that the gang be disorganized to make the track safe for approaching trains.

Motor-Car Set Offs

To what extent are motor-car set offs advisable? Where should they be located and at what intervals? How should they be constructed ?

Must Analyze Needs of Territory

By A. C. BRADLEY

Division Engineer, Chicago, Rock Island & Pacific, Des Moines, Iowa

In determining whether motor-car set offs are advisable it is necessary to analyze the requirements of the territory under consideration. Generally, set offs are advisable where the working conditions are such that bridge and building, signal, section and extra gangs must set off their motor cars in order to carry on their work in the most expeditious and economical manner.

Three factors must be considered in determining the number and location of the set offs: (1) The density of traffic, (2) topographical conditions and (3) the characteristics of the territory involved from the standpoint of the amount and nature of the work necessary for its proper maintenance. The set offs must be so located that they can be used by section gangs, signal maintainers and at certain places by bridge gangs. To accomplish this a study of the topographical conditions is essential, as it is not desirable to place set offs at a point where poor visibility of train movements may lead to accidents. However, maintenance officers cannot always be governed by this consideration, owing to the fact that the track alinement and gradient and the character of the terrain may necessitate the placing of set-offs adjacent to cuts. When motor cars are being set off at such points, a flagman should be sent out in order properly to protect the operation.

No definite rule can be established for the interval at which set offs should be placed. Under ordinary conditions, however, three to each mile are adequate if they are so located that they can be used to the best advantage. If topography and other conditions permit, a set off should be located in the vicinity of each mile post. They should not be placed too close to the ends of cuts, except perhaps in rough country where the grading necessary for their construction on high embankments renders this practice uneconomical.

In districts where the fills consist of ordinary earth, the sub-bases of the set offs should be constructed of this material, which should be topped by a finished surface of a reasonably hard material. Where it is available, crushed rock can be used, but generally, especially in the western region, timber planking should be imbedded in the earth base to provide either a runway of two timbers for the wheels or a complete covering of timber over the sub-base.

Advocates Three to Each Mile

By T. F. DONAHOE

Supervisor of Road, Baltimore & Ohio, Pittsburgh, Pa.

My opinion, based on several years' experience with various types of motor cars on both single and double track, is that motor-car set offs are necessary and should be built at intervals of three to the mile where there are no road crossings or spur tracks, in order to reduce the hazard of injury to men handling the cars, to reduce the possibility of damaging cars when removing them from the track and to increase the effective working time of gangs. If cinders are not available, the set offs should be constructed of earth and provided with a track of old switch ties, light rails or heavy plank imbedded in the fill. Near the track they should be level with the top of the rail, with a downward grade away from the track sufficient to bring the outer end 6 in. below the top of the rail.

To facilitate the removal of cars from the track, a portable platform should be provided at each set off that will be level with the top of the rails when placed between them on the ties and light enough to be handled by two men. In addition, on double track two wooden rails should be provided at each rest to allow cars to be transferred readily from one track to the other. If the platform and wooden rails are not carried on motor cars they should be chained and locked to the set off. The platform can be hinged at the center and carried on the rear end of the car, while the wooden rails can be hung on the side of the car. With this arrangement, two or three men can handle any section car with ease.

A light turntable for use in removing cars from the track can be constructed of two light rails, angle irons or 3-in. by 6-in. timbers fastened together with two lengths of pipe and provided with a bolster. The parts for this device may be carried under the platform of the car and across the rear end and can be put together quickly. In addition, it is necessary to carry two light wooden rails in order to allow the car to be transferred from track to track.

Another form of platform or turntable is hinged under the frame of the car in such a manner that the car is elevated in a balanced position when the apparatus is lowered to the ties and the car is pushed forward. The

base for this device should be at least 8 in. in diameter. Two light rails are also required in this instance to allow the car to be wheeled from the track onto the set off and two more are necessary if the car is to be moved from one track to another.

Smaller Forces Increase Usefulness

By L. G. BYRD
Bridge and Building Supervisor, Missouri Pacific, Wynne, Ark.

Where there are set offs, motor cars can be removed from the track in less time than is otherwise possible and the hazard of damaging them is reduced. They are also effective in reducing injuries to men while removing heavy motor cars from the track, this being a particularly important consideration at the present time because of the smaller size of gangs now in vogue. Moreover, with set offs at hand, foremen are less inclined to set cars off at public road crossings.

In single track territory, motor-car setoffs should not be more than one-half mile apart and the same rule should be applied in multiple-track territory, where set offs should be provided for each track. Increasing the number of set offs in a given territory reduces the time lost by track forces in moving from the set off to the site of their work.

Set offs should be at least 8 ft. wide and 20 ft. long, measured from the center of the track to the outer extremity of the set off. They should be constructed of earth up to the level of the subgrade and continued to the tops of the ties with cinders or gravel. They should be finished with a layer of screenings and, in order to prevent motor cars from rolling into the track, set offs should be sloped downward away from the track to a level 6 in. below the top of the rail. To facilitate the removal of cars, a plank should be placed parallel to and level with the top of each rail inside the track, with a flangeway of 2½ in. in each case, while another plank should be placed outside the track parallel to the rail on the side of the set off. Lag screws with counter-sunk heads are the best means of fastening these planks to the ties. The space between the planks inside the rails should be filled with ballast up to the tops of the planks.

Needed Today More Than Ever Before

By F. C. GAGE
Section Foreman, Michigan Central, Dexter, Mich.

Because of the smaller size of present-day section gangs, the use of heavier motor cars than formerly, the general application of rules prohibiting the setting off of motor cars at highway or farm crossings and the fact that on standard tracks the rails are from 18 in. to 30 in. above the shoulder of the roadbed, motor-car set offs are needed more today than ever before. When selecting locations for set offs, good judgment must be used as it is not necessary to construct them where heavy grading is required when there is a location nearby where they can be provided more cheaply. Furthermore, it is not good practice to construct them immediately adjoining farm or highway crossings as these can be used in emergencies to allow the passage of trains. Four or five set offs a mile are not too many.

The most satisfactory set off that I have built may be constructed of the following material: Twelve second-hand sawed crossties, 6 in. by 8 in. by 8 ft.; 5 planks, 2 in. by 10 in. by 8 ft.; 2 planks, 2 in. by 8 in. by 8 ft.; and 30 crossing spikes. After the grading has been completed, using earth or cinders, the first tie is laid parallel with the track against the ends of the track ties with its top 2 in. above the tops of the track ties. The remaining ties are then placed parallel with the first on a downward grade that will leave the top of the next to the last tie 6 in. below the first. The remaining tie is laid on edge with its top 2 in. above the adjacent tie to provide a bumper for the motor car wheels. The two 2-in. by 8-in. by 8-ft. planks are then spiked to the ties outside the rails and the five 2-in. by 10-in. by 8-ft. planks are placed in the same manner inside the rails. An 18-in. berm of earth or cinders is then built around the three open sides of the setoff and the sides, which are built to a slope of 1½ to 1, are sodded.

Renewing High Trestles

When renewing a high trestle and filling the ends to shorten it, should the piling be driven before or after the filling is completed? Why ?

Piling Should Be Driven First

By R. H. GILKEY
Division Engineer, Central of Georgia, Savannah, Ga.

In general, it is desirable to drive the piling before the filling is completed. The reasons for this are that if, as assumed by the question, the trestle is a high one, it may be, and usually is, difficult or impossible to get piles of the length required into the leads. Again, if the filling is done first, the bank bents must be driven through the entire depth of the fill, which may be so difficult that the penetration into the natural soil will be insufficient to sustain properly the load which the piles are required to carry. Driving in advance of the filling overcomes both of these difficulties.

Says Both Methods Have Advantages

By W. P. HOWSE
Bridge and Building Foreman, New Orleans & North Eastern, Poplarville, Miss.

This class of work involves advantages as well as disadvantages regardless of how it is performed. When the new embankment is placed before the piles are driven and is allowed to settle, the possibility of the piles being moved out of line and distorted by earth pressure is reduced to a minimum. I prefer, however, to do the driving first as the ground is then in condition for the accurate setting of the piles and any lining or bracing that may be necessary preparatory to capping is accomplished readily. When this procedure is followed, the fill should be evenly distributed to avoid undue pressure on any of the bents and, if a high embankment is involved, the bents should be tied together with longitudinal bracing.

Piling Should Be Driven in Advance

By A. B. SCOWDEN
General Bridge Inspector, Baltimore & Ohio, Cincinnati, Ohio

Assuming that the filling is to be handled by dumping the material from the track, the better practice is to drive the piling and also complete the new trestle construction in advance of the filling. This procedure simplifies the work by permitting the piling to be driven in the open, thereby avoiding interference with the longitudinal bracing of the old trestle. In addition, more usable material may be salvaged by completely removing that portion of the old trestle that would be covered by the slope of the new embankment. Furthermore, the removal of the old structure reduces the possibility of the

trestle becoming distorted during the filling operation and thereby lessens the work necessary to maintain the track in line and surface during this period.

While it may be claimed that the driving of the piling prior to the filling of the trestle will cause a portion of the new trestle to become distorted during the filling, my experience has been to the contrary, particularly where the piling is well driven, the bents properly braced and good filling material is used. As a general rule, therefore, the driving of the piles in advance of the filling is preferable, unless the advantages gained are outweighed by local conditions.

Contends Driving Piles Last is Best Method

By J. J. LABAT

Assistant Bridge and Building Foreman, Missouri Pacific, Wynne, Ark.

In order to provide a basis for discussion, it is assumed that the piling in question are those that are to be located within the limits of the slope of the embankment at the ends of the trestle. My experience has been that the best method is to drive the piling after the filling has been completed and has become thoroughly compacted. With this method it is possible to obtain the penetration of the piling necessary to avoid settlement and, in addition, they will not be forced out of line.

On a project recently carried out on the Missouri Pacific both methods of driving the piling were used. When the piles were driven before the filling work was commenced, the movement and settlement of the embankment often pushed the piling out of line and out from under the caps, resulting in very irregular bearing. This trouble has occurred after all bents were thoroughly braced. In some instances, moreover, the settlement of the embankment was found to cause one or two piles in a bent to be carried down as much as one to three inches farther than the remaining piles. No trouble has been experienced with the bents that were driven after the fill had been placed and allowed to settle.

I-Beam Stock Lists

What information must be recorded on a stock list of second-hand I-beams and other structural shapes, as well as of complete bridge spans, to insure their ready use when opportunity affords? How should such a stock list be handled ?

Record Depends on Type of Material

By JOHN L. VOGEL

Bridge Engineer, Delaware, Lackawanna & Western, Hoboken, N. J.

The practice of the railroad with which I am connected is to keep a record of the size, number and location of all usable second hand material, this record being handled directly by the bridge department. When the material is removed from the stock list, a record is made of the point of its disposition, and in the event that the material is removed for temporary use only the bridge department receives a further report at the time it is returned to the material yard or is stored elsewhere. In some instances it is necessary to ascertain the size of the beams by measuring accurately the depth, the width and thickness of the flange and the thickness of the web, this information being marked plainly on the beams.

In regard to the stock list for other structural shapes, it is our practice to carry only a limited amount of such material as angles, bars and plates for use in case of emergency. We also keep a stock list of complete bridge spans, compiling it in such a manner that information as to the length, depth of the floor, skew and general condition of each structure may be readily obtained. The record of the structural shapes mentioned is kept by the division bridge foreman, while the bridge department handles directly the record of complete spans.

Gives Only Brief Description

By H. S. LOEFFLER

Bridge Engineer, Great Northern, St. Paul, Minn.

Our practice is to prepare a statement showing second-hand and new structural steel spans that are carried in stock. The statement contains only a brief description of the material, specifying the size, weight and length of I-beams, the type, depth and length of bridge spans, and the design loading of each span. Information regarding the location of the material is also included. This statement includes only data on I-beams that are 18 in. or more in depth, smaller I-beams and other small miscellaneous structural shapes being omitted, as such material can ordinarily be obtained from steel warehouses on short notice.

Copies of this statement, which should be revised at intervals as may be necessary, should be distributed to district engineers, division engineers and other interested officers. It will be found quite valuable in case of washouts or other emergencies where the prompt installation of steel spans is necessary to maintain traffic.

One Office Originates All Records

By R. A. VAN NESS

Bridge Engineer, Atchison, Topeka & Santa Fe System, Chicago

On the Santa Fe, information regarding second-hand bridge and turntable material is listed separately in the stock list for such material. Bridge spans are listed in the order of their design loadings, beginning with the heaviest loading, the spans and girders in the various groups being listed in the order of their length, beginning with the longest. Next are listed, in the order of their length, miscellaneous spans that were designed for lighter line loads than allowed by the standard specifications. This is followed by a list of miscellaneous material, such as loose I-beams and stringers, plates, shoes, etc. The turntable list is subdivided into turntables, turntable tractors, turntable centers, radial blocks, etc.

The following information is given when listing bridge material:

1. The design loading or rating
2. The length and type of span
3. The file number of the plans
4. The place of storage
5. The stock price
6. The unloading, painting and repair charges.
7. The total cost
8. A general description of the condition
9. The number of the bridge for which the material was originally ordered.
10. A note indicating if the material has been reserved for future use at a particular location.

Similar information is given for the turntable material. The list is accompanied by a summary showing the total weight of each class of material on hand and the total value of the material in stock.

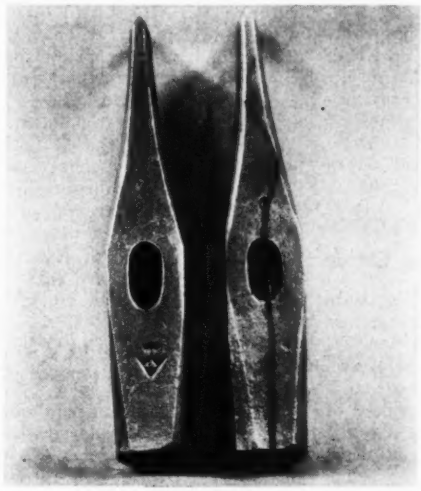
Confusion or conflict in assigning or shipping material is avoided by having all requisitions and orders for shipment originate at a single office. Whenever any change is made, all parties concerned are notified. The frequency with which new lists are issued depends on the rapidity of turnover of the material on hand.

New and Improved Device

Tests Tools with New Process

TO eliminate those track tools that are defective by reason of forging laps and tempering cracks, the Woodings-Verona Tool Works, Verona, Pa., has developed a method of testing these tools before shipment, whereby they are given an electro-magnetic charge which causes one edge of any seam that may be present to take a positive charge and the other edge to take a negative charge. The tool is then covered with a powder containing fine iron dust which, because of the polar-attraction induced along the seams, is attracted to these flaws and makes them evident. If no flaws or seams are present, none of the powder will adhere to the tool.

The charge is induced in the tool by placing it across two metal electrodes, one of which is connected to the positive pole and the other to the negative pole of the current supply. The process requires the use of current

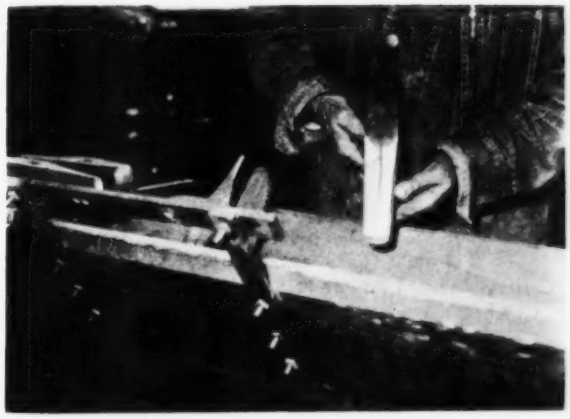


Two Track Chisels After Being Tested, in One of Which the Presence of a Defect is Indicated Clearly

having a high amperage and low voltage, which may be supplied by either a direct-current generator or a storage battery. In order that the charge may be of momentary duration, the circuit is controlled by a knife switch. This process is termed "polarization," since the tools are not magnetized in the ordinary sense of the word, and the process causes no change in the molecular structure of the steel or in the temper of the tool.

This test is being applied to all mauls, sledges, adzes and chisels manufactured by this company, and approximately two per cent of the tools are eliminated that would otherwise have been shipped to customers, since most of the defects are not visible to the naked eye or with a magnifying glass and would have been overlooked in the usual inspection.

This process is also being used to eliminate raw material with mill seams, to detect defects that originate during the forging operation in the course of manufacture, and to inspect tools that have been received for repair. In the latter case the tools are tested prior to being reworked, as well as after reworking, in order to eliminate those with severe cracks that have developed in service. With the assistance of the Woodings-Verona Tool Works, several railroads have installed this process in their reclamation departments for the purpose of eliminating any defective tools that may be present.



Testing Track Chisels by the New Process

What Our Readers Think

Repairing Wooden Highway Bridges

Carbondale, Ill.

TO THE EDITOR:

It has been the general practice to erect bents for overhead highway bridges of 12-in. by 12-in. sawed timbers, in many instances without preservative treatment. At or close to the ground line, if the timber is untreated, decay begins early and progresses rapidly. Furthermore, there is a limit to the length of timbers of these dimensions which can be obtained at a reasonable cost. As a result, for bridges that are higher than required for standard clearance, this usually means the construction of double-deck bents.

As a matter of fact, the cost of the extra sill and bracing for a double-deck bent and the additional labor for framing, erecting and applying the bracing will offset most if not all of the saving made by purchasing the shorter posts. If, on the other hand, creosoted piling, say 10 in. or more in diameter, sawed to length before treatment, are substituted for the 12-in. by 12-in. sawed timbers, the original cost of the posts will be reduced, the labor of erection will be less and the extra bracing will not be needed. Suitable second-hand material can be framed, sent to the treating plant and used for the sills, as well as for mud blocks.

There is no need for altering the plans materially, except to provide for batter on the outside posts. In making repairs the individual members of any bent can be replaced when the need arises, thus making it unnecessary to renew the bent as a whole.

HARRY J. BARCLAY
Bridge and Building Foreman, Illinois Central

[The treatment of second-hand timbers for use as sills and mud blocks, as advocated in this letter, calls for a note of caution. It is necessary to make sure that the timbers are entirely free from decay if the anticipated economy of treatment is to be realized. On the other hand, there is no economy in placing the treated piles on untreated sills—Editor.]

News of the Month . . .

Carriers Refused Permit to Reduce Rates on Day's Notice

The Interstate Commerce Commission has denied the application of F. L. Speiden, tariff publishing agent for the southern carriers, on behalf of the railroads generally, for an order permitting the railroads to establish on one day's notice reduced freight rates to meet motor-truck competition. The present law requires that changes in rates be published 30 days prior to the date on which they are to go into effect, although the commission may allow exceptions to this rule.

R. C. C. Loans to Railroads

The Railroad Credit Corporation on September 1, had either actually made or had authorized loans to railroads totaling $30,937,199, according to the monthly report of that corporation filed with the Interstate Commerce Commission. This organization was established to administer to needy carriers to meet their fixed interest obligations the funds derived from the freight rate increases authorized by the commission early this year. Funds obtained by the R. C. C. from the freight rate increases in the first six months totaled $31,075,145.36.

To Hold Safety Congress

The twenty-first annual safety congress and exposition will be held at Washington, D. C., on October 3-7 inclusive, with headquarters at the Wardman Park Hotel, according to a recent announcement of the National Safety Council. Since the Safety Section of the American Railway Association was merged with the Steam Railroad Section of the National Safety Council some time ago, this meeting will also constitute the annual meeting of the Safety Section.

Clough Honored at Banquet

Approximately 300 railroad men and other friends of Andrew M. Clough, supervisor of track on the New York Central at Batavia, N. Y., attended a complimentary dinner in his honor at Batavia on September 24, on the occasion of his retirement from active service on September 30. Those in attendance at the dinner, which took place in the Hotel Richmond at 1:00 p. m., included the following officers of the New York Central: D. W. Dinan, general manager; John V. Neubert, chief engineer maintenance of way; W. A. Murray, engineer maintenance of way; D. R. MacBain, assistant to vice-president, and others representing the operating, mechanical, signal, engineering and maintenance of way departments. Addresses were presented by several of these officers as well as by Mayor Charles W. Hartley of Batavia. During the morning of the same day, Mr. and Mrs. Clough, aided by other members of the family and friends, held a reception at their home. Detailed information regarding Mr. Clough's railway experience is presented in the Personal News section of this issue.

Ask Loans for Maintenance

A number of roads have taken steps to avail themselves of the facilities of the Reconstruction Finance Corporation for obtaining funds to carry on maintenance operations. The Chicago & North Western has requested a loan of $1,000,000 for the purchase of roadway materials, principally ties, as a means of promoting employment, while the Chicago & Eastern Illinois has applied for a loan of $100,000 for the purchase and relaying of 1,150 tons of rail.

Railroads Get Lower Rates on Cotton

In a recent decision of the Interstate Commerce Commission, the railroads won the right to establish rates on cotton that will put them on a competitive basis with truck carriers and with truck-barge combinations. In the decision, Division 2 of the commission announced that it would not exercise its authority to suspend the proposed rates, which represented reductions ranging up to 50 per cent of existing rail rates. The lower rates will apply to shipments consigned from points in Arkansas, Louisiana, Oklahoma and Tennessee to Gulf ports, while others will apply from Southwestern points to destinations in Southern and Official territories and Canada and between Mississippi Valley and Southeastern points.

Manufacturers Form Finance Corporation

Manufacturers of railway equipment and supplies have completed the organization of the Railway Equipment Financing Corporation, a credit agency designed to help the railroads to purchase equipment through loans from the Reconstruction Finance Corporation. Under the plan the railroad will borrow 80 per cent of the purchase price of the equipment from the Reconstruction Finance Corporation, securing the loan with trust certificates. It also provides that the equipment company shall take in part payment for the equipment, junior equipment trust certificates which it will in turn deposit with a financing company which will pledge these certificates as additional collateral to secure repayment by the railroad of its loan from the Reconstruction Finance Corporation.

Minnesota "Ship-by-Rail" Club Organized

On September 16, at a public mass-meeting at St. Paul, Minn., 86 "ship-by-rail" clubs of Minnesota inaugurated a state and nation-wide drive to stop the spending of the tax-payers' money for subsidies to waterways and commercial highway transportation agencies and to bring all forms of transportation under equal regulation. A state-wide organization, known as the Minnesota Ship-by-Rail Association, was formed to correlate the work of the local ship-by-rail clubs, and to expand the movement to national scope.

Railroads Protest Transportation of School Coal by Truck

Railroads with general offices in St. Louis, Mo., have filed a formal protest with the St. Louis Board of Education against the board's action in ordering that virtually all its coal for the coming winter shall be carried by motor truck instead of by railroad. The 16 railroads joining in the protest pointed out that they paid a large share of the taxes which support the public schools, and that normally the railroads disburse in St. Louis through payrolls approximately $55,000,000 annually to their 34,000 employees. The Board of Education estimates that it would save $12,485 by purchasing coal carried by truck.

Asks Protection of Quail on Railroad Premises

Estimating that sufficient quail make their nests on railroad rights-of-way in this country to produce 975,000 young quail yearly, if protected, the game protective association known as More Game Birds in America, Inc., has issued an appeal to all the railroads asking their cooperation in protecting these nests. It is pointed out that track foremen can do much to protect quail nests by leaving a circle of vegetation about eight feet in diameter around each nest when clearing the right of way, by burning the right of way, where this is the practice, prior to March 1 or in the fall, and by preserving the eggs for artificial incubation if it is impracticable to protect the nest from damage.

Savings Banks to Aid Railroads

For the first time the mutual savings banks of the country will undertake a direct part in the settlement of the nation's railroad difficulties, according to an announcement by Wilson G. Wing, president of the National Association of Mutual Savings Banks, whose depositors total 13,432,139. The banks of this organization hold about 15 per cent of all outstanding railroad bonds. This organization has appointed a committee on rail-

Woodings Gauging Tool

Will Facilitate Fall Gauging and Rail Laying

Reduces labor customarily required to pull rails and holding them to gauge while spiking

Jabbing of picks into ties is eliminated

Tool is operated by one man

Can be used on all rail sections from 60 lb. to 152 lb.

Made of best quality double strength pipe and highest grade steel castings thoroughly insulated

Light in weight—20 pounds

A Husky Time Saving Tool Designed for Rough Service

Woodings Forge and Tool Co.

VERONA, PA.

road investments, which is charged with the responsibility of keeping closely in touch with railroad affairs, particularly with respect to the safeguarding of the underlying bonds that are held by mutual savings banks.

Seven Months Net Drops to 0.92 Per Cent

Class I railroads of the United States had a net railway operating income of $123,926,226 for the first seven months of 1932, which was at the annual rate of return of 0.92 per cent on their property investment, as compared with a net operating income of $297,464,734, or 2.20 per cent, in the first seven months of 1931, according to reports compiled by the Bureau of Railway Economics. Gross operating revenues for the first seven months totaled $1,839,254,554, as compared with $2,564,567,683 for the same period in 1931, or a decrease of 28.3 per cent. Taxes paid in the first seven months amounted to $173,626,719, as against $191,766,919, for the same period in 1931, a decrease of 9.5 per cent. Seventy Class I railroads operated at a loss in the first seven months.

Shippers Organize to Regulate Trucks

The formation of an organization of shippers, to be known as the National Association for Motor Truck Regulation, has been announced by the New Jersey State Chamber of Commerce. In a statement issued in connection with the announcement it was said that an increasing number of shippers realize that the trend in transportation is chaotic and that, if allowed to continue, it is very likely to result in the breakdown of our transportation arteries. This organization takes the position that "all the competitive transportation agencies should be permitted to flourish under fair and equal treatment." Ten states are represented on the board of directors of the shippers' organization, and the membership is said to be scattered throughout the territory east of the Mississippi river.

Colonel F. G. Jonah Is Honored

Colonel Frank G. Jonah, chief engineer of the St. Louis-San Francisco, has been awarded the Order of the Purple Heart in recognition of his military service during the World war. Colonel Jonah, who held the rank of major, served overseas with the First Battalion, Twelfth Engineers (Railway), which comprised a group of volunteers recruited at St. Louis, Mo. Later he served at the American General Headquarters as chief engineer of the Department of Light Railroads. Colonel Jonah was also cited by General Pershing, commander-in-chief of the American Expeditionary Forces, at the close of the war, and he was awarded a medal by the government of Poland. The Order of the Purple Heart was founded by George Washington as a reward for soldiers who distinguished themselves in the war for independence. Following his death no further awards were made until recently when President Hoover revived the order as a tribute to Washington.

Association News

Wood Preservers Association

A meeting of the Executive committee will be held in Chicago on October 19, at which time the program for the twenty-ninth annual meeting will be developed and other business of the association transacted.

Bridge and Building Association

Members of the Executive committee will meet in the C. & N. W. general offices, Chicago, on Saturday, October 1, to make such revisions in the activities of the association as are necessary, following the postponement of the convention and to transact such other business as may warrant attention.

Roadmasters Association

L. M. Denney, supervisor, C. C. C. & St. L., Indianapolis, Ind., has accepted the chairmanship of the Committee on Routine Track Inspection, Its Purpose, Scope and Value, succeeding M. Canavan, general roadmaster, U. P., who has been forced to relinquish this position in order to concentrate on other matters for the remainder of the year.

Metropolitan Track Supervisors' Club

The first fall meeting of the Metropolitan Track Supervisors' Club will be held on Thursday, October 20, at Keen's Chop House, 72 West Thirty-Sixth street, New York. Following dinner, which will be served at six p. m., the club will be addressed by George J. Ray, chief engineer, Delaware, Lackawanna and Western, who will discuss the high points of the New York suburban zone electrification project of that road. Following Mr. Ray, J. S. Thorp, electrical engineer of the Lackawanna, will give an illustrated talk on the details of the electrical program.

American Railway Engineering Association

Six committees of the American Railway Engineering Association held meetings in September, and to date five committees have scheduled meetings for October, these meetings being held primarily for the purpose of reviewing and accepting the reports of subcommittees for present action at the convention next March. All of the September meetings were held in Chicago, excepting that of the Committee on Economics of Railway Operation, which met in Pittsburgh on September 30. The Committee on Roadway held a meeting on the 12th; Records and Accounts on the 13th; Economics of Railway Labor on the 15th; Grade Crossings on the 16th; and the Committee on Track on the 21st. During October the Committee on Yards and Terminals will meet at Detroit on the third and fourth; the Committee on Wooden Bridges and Trestles in Chicago on the seventh; the Committee on Iron and Steel Structures at Buffalo, N. Y., on the thirteenth and fourteenth; the Committee on Wood Preservation and the Committee on Water Service at Chicago on the eighteenth.

Members of the association received three mailings of publications from the secretary's office during the month of September, namely, Bulletin 346, consisting primarily of papers and addresses presented at the March convention; Bulletin 347, covering revisions and additions to the Manual; and the bound volume of Proceedings of the Association for 1932. No other bulletins will be issued until the committee reports are ready.

Maintenance of Way Club of Chicago

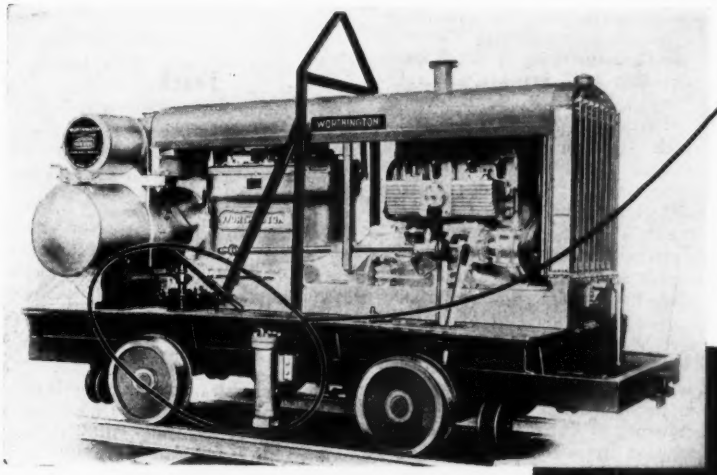
The Maintenance of Way Club held its Twelfth annual dinner at the Auditorium Hotel, Chicago, on Wednesday, September 21, at 6:30 p. m., with an attendance of 81 members and guests. The speaker of the evening was C. J. Geyer, assistant to the vice-president of the Chesapeake & Ohio, who spoke on "How the Roadmaster Can Meet the Conditions of Today." Mr. Geyer's paper was discussed by John V. Neubert, chief engineer maintenance of way of the New York Central and others.

The following were elected to office for the ensuing year: President, J. J. Davis, supervisor of track, E. J. & E.; first vice-president, R. H. Carter, supervisor of track, I. C.; second vice-president, F. N. Hoyt, superintendent maintenance of way, Chicago Rapid Transit Lines; secretary-treasurer, W. S. Lacher, managing editor, *Railway Engineering and Maintenance* (re-elected); members of the executive committee for two years—Armstrong Chinn, chief engineer, Alton; L. T. Day, roadmaster, C. & N. W.; and G. A. Carlson, Ramapo-Ajax Corp.; member of executive committee to serve an unexpired term of one year, E. J. Brown, roadmaster, C. B. & Q.

Asserts Waterways Will Not Benefit Wheat Growers

The oft-repeated argument of waterway advocates that the wheat farmers of the country will be among the principal beneficiaries of advantages accruing from the development of inland waterways received a blow in a recent study of the Food Research Institute of Stanford University. In the conclusions of the report it was stated that the completion of the St. Lawrence seaway project, connecting the Great Lakes with tidewater by means of the St. Lawrence river, may actually depress American farm prices by stimulating wheat production in Canada. It was pointed out, furthermore, that the Mississippi route will divert shipments from only limited territories and that it will not effect the active export areas of Texas-Oklahoma and the Pacific Northwest.

THE WORTHINGTON *AIR KING* COMPRESSORCAR . . . A TRACK MAINTENANCE POWER PLANT

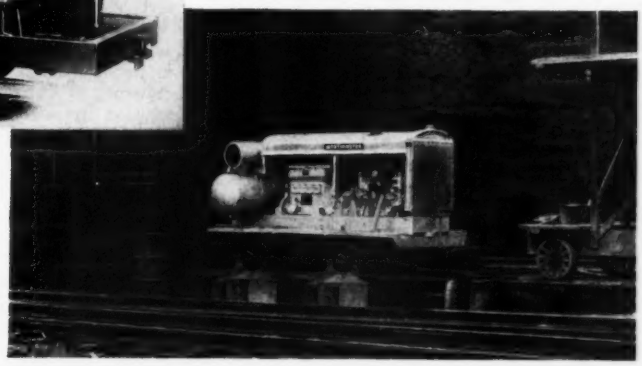


Hydraulic Jacks

Consist of two 4-inch diameter oil cylinders, pistons and rail grips. Cylinders bolt to side channel frames at center of gravity. Twenty-five strokes of high pressure pump, mounted on running board of car, raises the jacks six inches, allowing cross ties to be inserted under transverse derailing wheels.

Advantages: **Will not freeze. Car can be raised and moved by one man in one operation, without running the compressor.**

(Furnished as extra equipment)



Specially designed *for Railroad use*

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Personal Mention

General

William K. Etter, general manager of the Coast Lines of the Atchison, Topeka & Santa Fe, with headquarters at Los Angeles, Calif., who first entered the service of the Santa Fe as a rodman in the engineering department, has been elected vice-president in charge of operation of the Santa Fe System, with headquarters at Chicago.

W. H. Hillis, who has been in charge of the construction of the Childress-(Tex.)-Pampa line of the Ft. Worth and Denver City (a subsidiary of the Chicago, Burlington & Quincy), has returned to his former position as assistant superintendent of the La Crosse division of the Burlington, with headquarters at North La Crosse, Wis., following the recent completion of the line.

Engineering

W. H. Gardner, assistant engineer on the Illinois Central, with headquarters at McComb, Miss., has been assigned to other duties and his position abolished.

Following the consolidation of the Shasta division of the Southern Pacific, Pacific Lines, with the Sacramento division on September 15, **J. A. Given,** division engineer of the former division, has been appointed district engineer, with headquarters as before at Dunsmuir, Calif.

P. D. Fitzpatrick, who has been appointed chief engineer of the Grand Trunk Western, with headquarters at Detroit, Mich., to succeed **J. A. Heaman,** as noted in the September issue of *Railway Engineering and Maintenance,* has been placed in charge of bridges and buildings, track and signal maintenance, in addition to the duties heretofore performed by Mr. Heaman.

Duncan R. Campbell, who has retired as general superintendent of construction of the Western region of the Canadian National, with headquarters at Winnipeg, Man., as noted in the September issue of *Railway Engineering and Maintenance,* was born on April 9, 1875, at Kirkfield, Ont., and received his public school education at that place. He entered the service of the Canadian Northern (now part of the Canadian National) on May 1, 1896, at Gladstone, Man., being promoted to assistant superintendent of the construction department two years later. In 1900, he was appointed superintendent of that department, which position he held until October 1, 1915, when he was transferred to the operating department as assistant general manager of the British Columbia district, with headquarters at Vancouver, B. C. He retained this position until 1921, when he was appointed general superintendent of construction of the Western region, with headquarters at Winnipeg. Mr. Campbell occupied this position continuously until his retirement on July 31.

Hugh T. Hazen, assistant chief engineer of the Canadian National, with headqurters at Montreal, Que., has been appointed chief engineer of the Atlantic region, with headquarters at Moncton, N. B., succeeding **A. F. Stewart,** who retired on September 1. **R. A. Baldwin,** engineer of construction of the Central region, with headquarters at Toronto, Ont., has been appointed district engineer at North Bay, Ont., succeeding **C. H. N. Connell,** who has been transferred.

Mr. Stewart's railway engineering career comprises service in the United States, Canada and South Africa. He was born at Cape Breton, N. S., and began his railway career in the state of Maine in 1887. Later he returned to Canada and engaged in various engineering capacities, after which he went to South Africa to engage in railway construction work. In 1902 he returned to Canada to take part in the location of an extension of the Halifax & Southwestern (now part of the Canadian National), and on the completion of this work he again went to South Africa where, for a time, he was connected with the government railways. On his return to Canada in 1909, Mr. Stewart was appointed chief engineer of the Canadian Northern (now part of the C. N. R.), with jurisdiction over the lines east of Port Arthur, Ont. Following the consolidation of the Canadian Northern and the Canadian government railways into the C. N. R. in 1920, Mr. Stewart was appointed chief engineer of the lines east of Montreal, with headquarters at Moncton. On the creation of the Atlantic region in 1923, he was appointed regional chief engineer, which position he held until his retirement.

Mr. Hazen was born on March 14, 1870, at Truro, N. S., and after a public school education he entered railway service in 1889, with the Ottawa & Gatineau (now part of the Canadian Pacific), where he served in various positions from rodman to assistant engineer on location and construction. From 1893 to 1895, Mr. Hazen was engaged in locating a number of short lines, and in the latter year he entered the service of the New York Central & Hudson River (now the New York Central), where he was engaged on construction work until 1897, when he went with the Canadian Pacific in a similar capacity. From 1900 to 1904, he was engaged on the location and construction of the Grand Trunk, then going with the Canadian Northern (now part of the C. N. R.), where he served as division engineer on the Canadian Northern Ontario, chief engineer of the Canadian Northern Quebec, chief engineer of the Duluth, Winnipeg & Pacific and chief engineer of the Toronto (Ont.) Suburban Railway, all subsidiaries of the Canadian Northern. Subsequently, Mr. Hazen was appointed engineer maintenance of way of the latter road, and in 1920 he was appointed acting chief engineer of the Canadian National lines east of Port Arthur, Ont. In 1923, he was appointed assistant chief engineer of the Central region of the Canadian National at Toronto, Ont., and in the following year he was made assistant chief engineer of the system, with headquarters at Montreal, Que. In 1912-13, Mr. Hazen was with the Dominion government as engineer in charge of the Hudson Bay terminals at Port Nelson, Ont.

Track

M. A. Sheehan has been reappointed to his former position of supervisor of track on the Illinois Central, with headquarters at Mattoon, Ill.

H. G. Dennis, a track inspector on the Iowa-Minnesota division of the Chicago, Rock Island & Pacific, has been promoted to roadmaster on the same division, with headquarters at Manly, Iowa, to succeed **George Tjaden,** who has been granted a leave of absence.

G. L. Griggs, Jr., a track supervisor on the Chicago, Burlington & Quincy, with headquarters at Centralia, Ill., has been promoted to roadmaster with the same headquarters, succeeding **E. L. Shields,** whose death is noted elsewhere in these columns.

Andrew M. Clough, a past-president of the Roadmasters' and Maintenance of Way Association of America, and for the past 22 years a supervisor of track on the New York Central, with headquarters at Batavia, N. Y., retired from active service on September 30. Mr. Clough was born in Scotland on September 13, 1862,

Andrew M. Clough

and was educated at Willfield Academy and the University of Edinburgh. He came to this country as a young man and entered railway service on August 15, 1883, as a laborer on the Michigan Central. On March 15, 1885, he was advanced to track foreman, and in April, 1886, he was further promoted to extra gang foreman. On July 15, 1889, Mr. Clough was appointed roadmaster on the Eastern division, with headquarters at Waterford, Ont., where he remained until October 15, 1893, when he left the Michigan Central to enter the service of the New York Central & Hudson River (now part of the N. Y. C.), as a yard foreman, with headquarters at Niagara Falls, N. Y. On December 1 of the following year, Mr. Clough was appointed construction fore-

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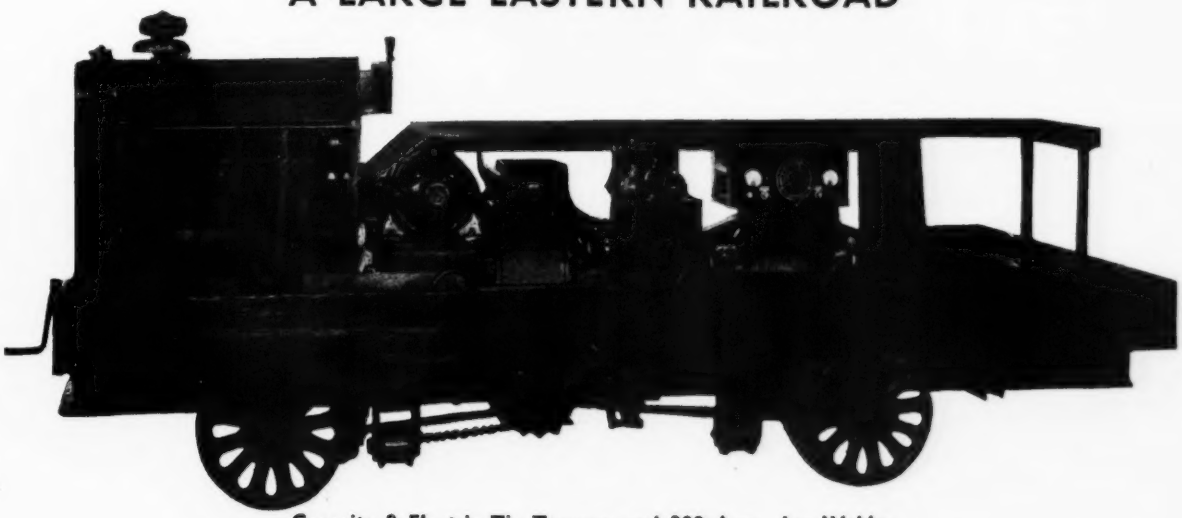

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man at Suspension Bridge, N. Y., and on April 1, 1895, he was advanced to assistant supervisor at Batavia. On April 16, 1898, he returned to the position of construction foreman, and on November 10, 1898, he was again appointed assistant supervisor of track, with headquarters at Hudson, N. Y. Mr. Clough was promoted to supervisor of track at Kingston, N. Y., on April 15, 1900, being transferred to Batavia on December 1 of the same year. On July 1, 1902, he was appointed general track inspector with jurisdiction over all divisions east of Buffalo, N. Y., again assuming the position of supervisor of track at Batavia on December 1, 1902. During the following eight years, Mr. Clough alternated between the positions of supervisor of construction at various points and supervisor of track at Batavia, having held the latter position continuously from December 1, 1910, until his retirement.

P. A. Benson, a roadmaster on the British Columbia district of the Canadian Pacific, with headquarters at Mission, B. C., has been transferred to the Revelstoke division, with headquarters at Revelstoke, B. C., to succeed **H. Anderson,** who has been transferred to Salmon Arn, B. C., on the same division to replace **Frank Topham,** who has been transferred.

L. B. Mills, a roadmaster on the Victoria division of the Southern Pacific Lines in Texas and Louisiana, with headquarers at Cuero, Tex., has been transferred to Edinburg, Tex., on the same division, to replace **A. J. Bolsins,** who has been transferred to the Austin division, with headquarters at Giddings, Tex., succeeding **R. E. Dell,** who has resigned. The territory formerly occupied by Mr. Mills has been apportioned among the other roadmasters on the Victoria division.

Obituary

E. L. Shields, a roadmaster on the Chicago, Burlington & Quincy, with headquarters at Centralia, Ill., died on August 25 of appendicitis.

Thomas Turnbull, who retired early this year as engineer maintenance of way of the Western region of the Canadian National with headquarters at Winnipeg, Man., died suddenly on September 14. A complete biographical sketch of Mr. Turnbull was presented in the February, 1932, issue of *Railway Engineering and Maintenance,* page 126.

Robert V. Massey, vice-president in charge of personnel of the Pennsylvania, who advanced through the engineering department of this company, died on September 18, at his home at Wayne, Pa., after a long illness. Mr. Massey was born on September 29, 1871, at Dover, Del., and graduated from Sheffield Scientific School of Yale University in 1892. He entered railway service in the same year in the construction department of the Pennsylvania and three years later he was transferred to the maintenance of way department. In November, 1895, Mr. Massey was appointed assistant supervisor of track, serving in this capacity on various divisions until 1900, when he was promoted to supervisor of track on the Schuylkill division. After seven years as supervisor at various points, Mr. Massey was further advanced to division engineer of the Schuylkill division and in 1909 he was transferred to the New York division. In March, 1911, he entered the operating department as a superintendent, serving on various divisions until June, 1917, when he was advanced to general superintendent of the Eastern Pennsylvania division, with headquarters at Altoona, Pa.

Robert V. Massey

On July 1, 1918, he was transferred to the New Jersey grand division, and on March 1, 1920, he was promoted to assistant general manager of the Eastern region, being further advanced to general manager of that region in 1923. Three years later, Mr. Massey was promoted to assistant vice-president in charge of personnel and in July, 1928, he was elected vice-president.

Morris A. Zook, president of the Montana, Wyoming & Southern, who had held important engineering positions with many railroads throughout the country, died on September 3, at Mt. Vernon, N. Y. Mr. Zook was born on March 2, 1859, at Philadelphia, Pa., and graduated in civil engineering from the Pennsylvania Polytechnic College. During his railway engineering career, he served with the Norfolk & Western and the Shenandoah Valley (now part of the N. & W.), as resident engineer and division engineer in charge of heavy construction and location; with the Pennsylvania, Lines West of Pittsburgh, as engineer of maintenance; as engineer maintenance of way and general roadmaster of the Cincinnati Southern (now part of the Southern); as chief engineer of the Louisville, Evansville & St. Louis (now also part of the Southern); as chief engineer and later as consulting engineer of the Peabody Coal Company of Chicago, in which capacities he constructed, organized and operated the Chicago & Illinois Midland; and as engineer of construction of the Chicago Great Western. On January 1, 1914, he became resident engineer, Bureau of Valuation, of the Interstate Commerce Commission, with headquarters at Washington, D. C. On March 27, 1922, he was elected vice-president of the Montana, Wyoming & Southern being elected president shortly thereafter.

Supply Trade News

Personal

Frank L. Gibbons, who has been connected in a sales capacity with the **Republic Steel Corporation,** has been appointed director of steel sales of the **Timken Steel & Tube Company,** Canton, Ohio.

G. L. Harman has been appointed general sales manager of the **Keystone Driller Company,** Beaver Falls, Pa., and **L. H. Ransom,** has been appointed chief engineer. Until recently Mr. Harman was sales manager of the Industrial Brownhoist Corporation; he had also served in the same capacity with the Industrial Works, Bay City, Mich., from 1914 until the company was merged with the Brown Hoisting Machinery Company.

Obituary

Homer W. Woodruff, Jr., vice-president of the Gulf States Creosoting Company, Hattiesburg, Miss., died on August 4.

Fred G. Zimmerman, who resigned as vice-president, secretary and treasurer of the T-Z Railway Equipment Company, Chicago, in 1929, died at Louisville, Ky., on August 27.

Richard D. Purcell, treasurer and a director of the Ingersoll-Rand Company, died suddenly on September 20 in the office of the company at New York. He had been in the service of this company for 45 years and was 59 years of age at the time of his death.

Fred N. Baylies, who resigned as vice-president of the P. & M. Company, Chicago, with headquarters in New York, in 1928, died at Hollywood, Cal., on September 2, following a heart attack. Mr. Baylies entered the service of the P. & M. Company in 1915, as a representative at New York, and was later appointed vice-president, which position he held until his retirement. Prior to 1915 he was connected with the Aluminum Company of America as a sales representative.

Trade Publications

Rock Drills and Sharpeners.—This is the title of a 32-page illustrated catalog recently published by the Ingersoll-Rand Company, New York, in which is consolidated essential information concerning this company's equipment for drilling rock and for reconditioning drill steels.

Carnegie Steel Sheet Piling.—The Carnegie Steel Company, Pittsburgh, Pa., has issued a pamphlet containing photographs and drawings of several recent installations of this company's steel sheet piling. This pamphlet, which is known as Insert-A for inclusion in the Carnegie Steel Sheet Piling catalog, contains 24 pages.

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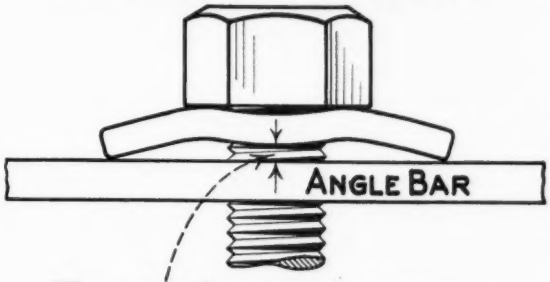

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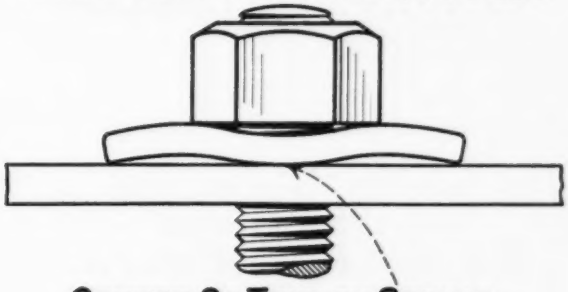

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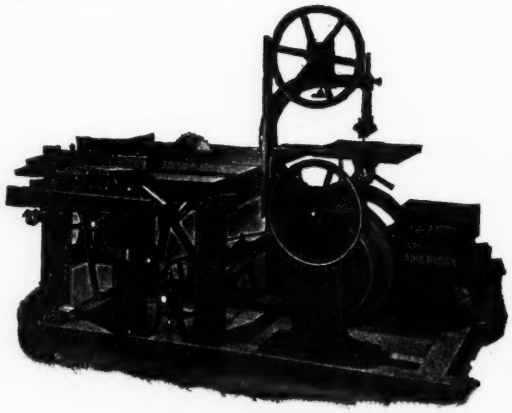

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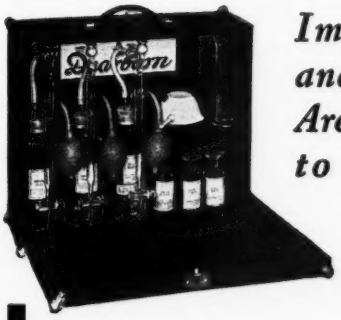

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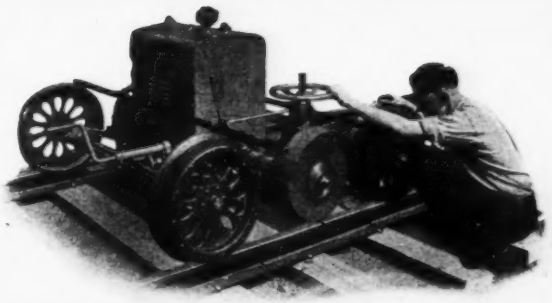

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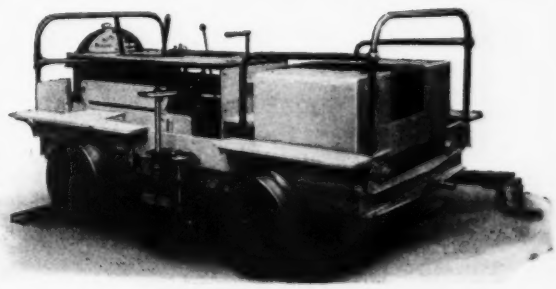

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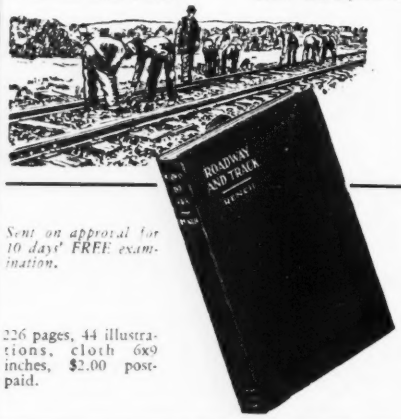

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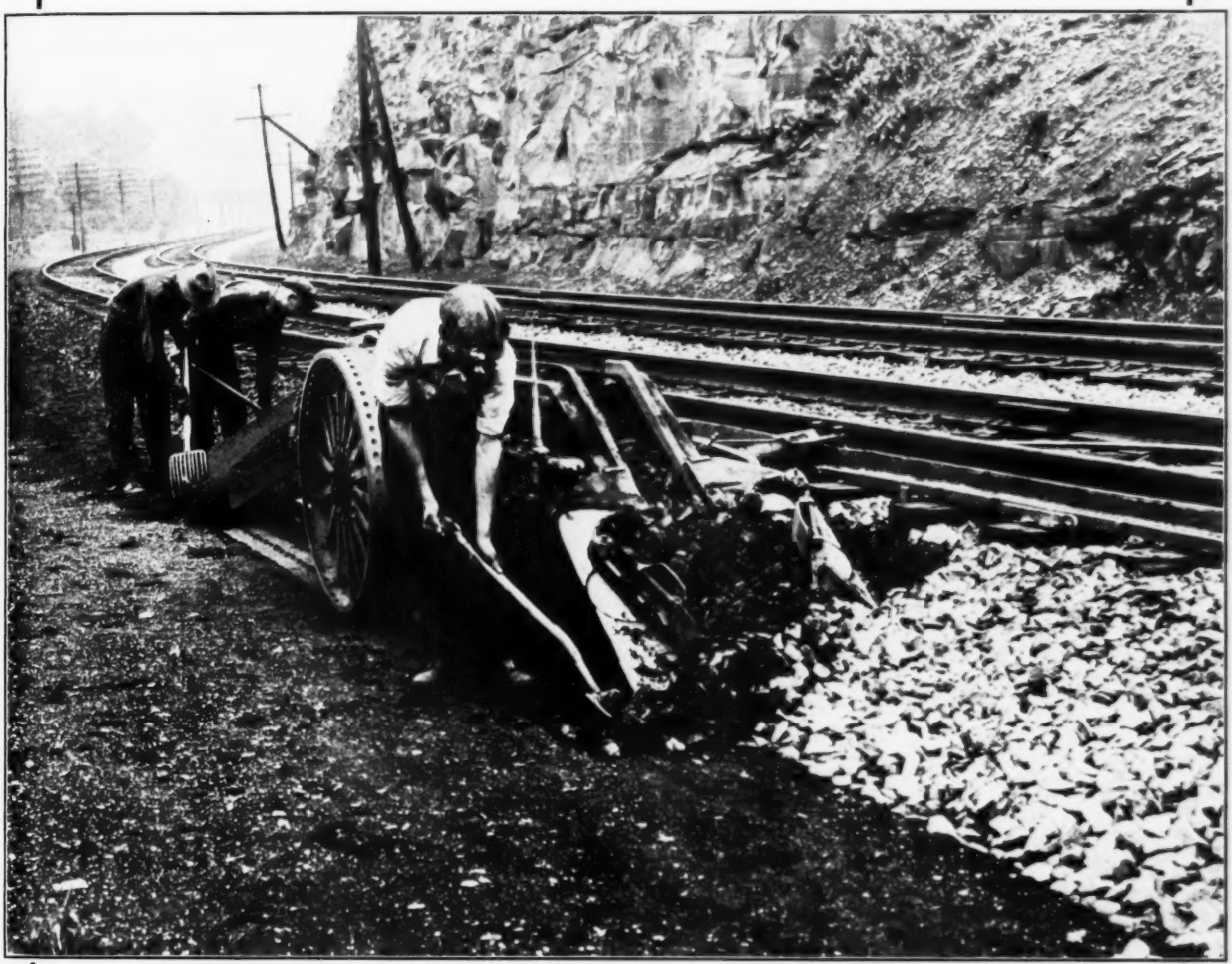
MOLES

Clean Ballast Without Obstructing Tracks



MOLES WILL CLEAN BORDER BALLAST WITH A CREW OF FROM TWO TO THREE MEN AT A RATE OF 150 LINEAL FEET PER HOUR, AT A COST OF .015 CENTS PER LINEAL FOOT.

A number of Moles cleaned over 40 miles of border ballast each last season.

RAILWAY MAINTENANCE CORPORATION

Pittsburgh, Pa.

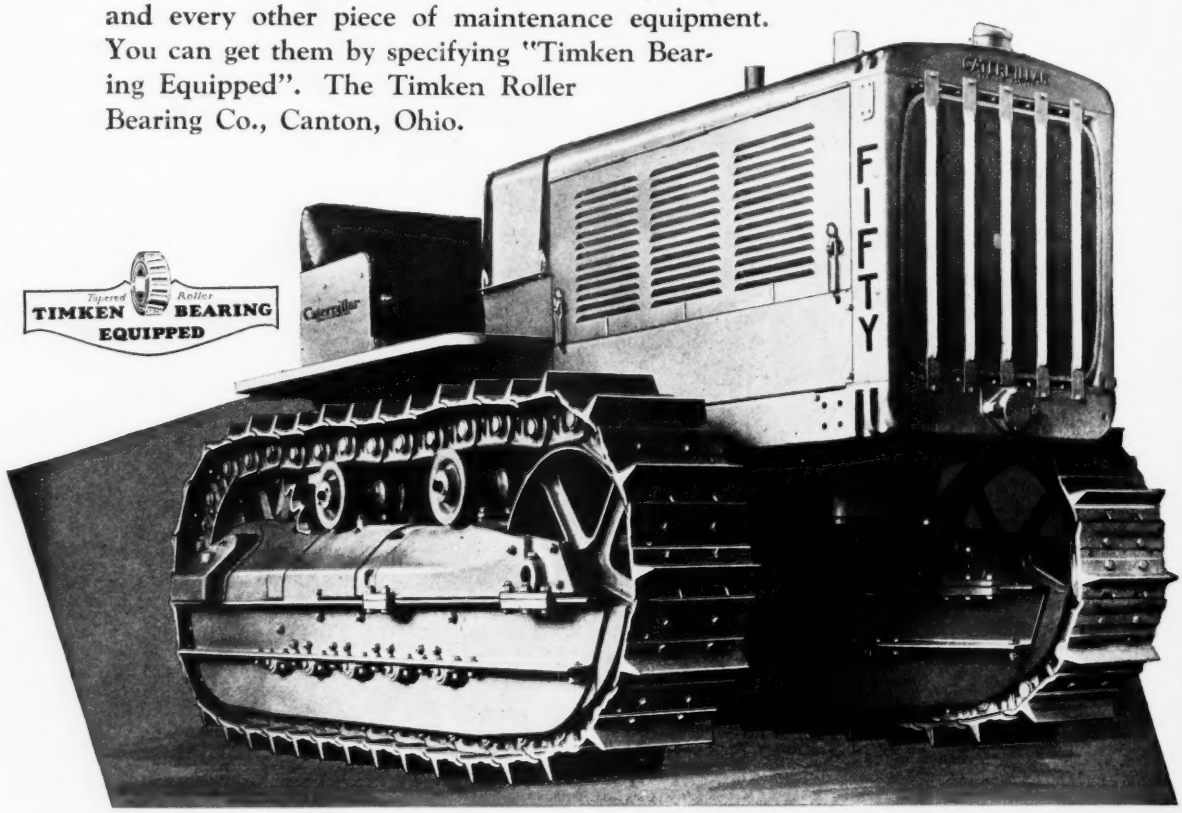
For Lower Maintenance Costs —Timken-equipped Tractors

With their sturdy power available for winches, booms, pumps, air compressors and post hole diggers, tractors are playing an important part in the cost reduction programs of railway maintenance work.

By the same token, Timken Bearings are greatly increasing the efficiency and endurance of the modern tractor. Practically every leading make is Timken-equipped.

Timken protection means more than merely friction elimination. It means ability to carry both thrust and radial loads; negligible expense for lubrication and maintenance; permanent alignment for shafts and gears; extra years of economical service.

Only with Timkens can you get those qualities in the maximum degree, because only Timken has the exclusive combination of tapered construction, positively aligned rolls and Timken-made special alloy steel. You want these money saving advantages in your tractors, your power shovels, your section cars and every other piece of maintenance equipment. You can get them by specifying "Timken Bearing Equipped". The Timken Roller Bearing Co., Canton, Ohio.



TIMKEN *Tapered Roller* BEARINGS

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